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Assessing the Effect of a Learning Organization on Change in Levels of Developmentally Supportive Care in the Newborn Intensive Care Unit

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ASSESSING THE EFFECT OF A LEARNING ORGANIZATION ON CHANGE IN LEVELS OF DEVELOPMENTALLY SUPPORTIVE CARE IN THE NEWBORN INTENSIVE CARE UNIT

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ABSTRACT

This study assessed the effect of a learning organization of clinical nurse leaders on an increase in levels of developmentally supportive, family-centered care (DSC). The intervention occurred in the Newborn Intensive Care Unit (NICU) at Magee-Womens Hospital, Pittsburgh, PA. Clinical nurse leaders ($N = 9$) were encouraged to model research-based, developmentally supportive techniques. The *Checklist for Observing Developmentally Supportive Care in the NICU* was developed to assess the levels of DSC in 17 measurable techniques in three conceptual areas: environmental support, individualized support, and family-centered care. The checklist includes adaptations for infants with medical or familial issues. Infants and caregivers remained anonymous. Blinded to the purpose of the study, two trained raters collected data. Using Cohen's Kappa (unweighted), rater observations were compared to the Principal Investigator's. Reliabilities per criteria were estimated at 0.74-1.00, with 10 of 17 criteria above 0.92, 14 above 0.85. Summary measures of observations in conceptual areas were compared pre- and post intervention using the Mann-Whitney *U* non-parametric test. Results showed significant increase ($p < .01$) in the use of optimal levels of environmentally supportive care, no significant differences in optimal levels of support in individualized care, and significant decrease ($p < .001$) in optimal levels of family-centered care techniques. Pre- post intervention ratings for each criterion were analyzed using exact chi-square statistics. There were significant positive changes in 4 of 5 criteria in environmentally supportive care, significant negative changes in 2 of 7 criteria in individualized support and in 1 of 3 criteria in family-centered care. Dialogue revealed philosophical/experiential biases in promotion of family-centered care. Although the

clinical nurses deemed individualized/family-centered care valuable, they insisted that ancillary support was needed for consistent caregiving in these areas. Environmental support was more easily provided. Strategies generated by the learning organization to overcome obstacles to DSC included: interventions in environment and parent support, increase in facilitation of individualized/family-centered techniques by specialists, and endorsement of the checklist to measure levels of DSC, with the possibility of tracking individual infant care. Findings of this study encourage use of learning organizations to promote DSC as the standard of best practices in NICUs.

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ACKNOWLEDGMENTS

Thank you, my Precious Family and Friends. You know how you held me up and I know how you held me throughout this project. You will always be in my heart and prayers. I am grateful.

To You, my Inspiration, my Strength,

my Consolation.

Come! Come, Holy Spirit, come!

Where You are not, man has naught…

--Sequence from the Mass of Pentecost

CHAPTER I

STATEMENT OF THE PROBLEM

Introduction

The survival of premature infants at earlier gestational ages has been achieved through advancing medical technology. As the survival rate has improved, the literature describing medical advances and the care of the premature infant has increased. The literature focuses on specific problems of the preterm infant, and presents viable treatment options to prevent exacerbation of conditions and to avoid developmental consequences. Not only has medical technology made it possible for the extremely premature (approximately 23-27 weeks gestation) to survive, but also, developmentally specific interventions have been formed to reduce the stress of the neonate, resulting in an improved quality of life.

The Physical and Developmental Environment of the High-Risk Infant is an international annual conference held in Florida. At the 1999 through 2005 conferences, professionals from healthcare disciplines involved in the intensive care of infants, expressed an urgency to promote developmental care programs. The purpose of these programs is to address the caregiving in the newborn intensive care unit (NICU), which is suspect for an increased incidence in motor, sensory, and other developmental problems (Blackburn, 1995).

Developmental care is "a broad category of interventions designed to minimize the stress of the NICU environment. These interventions may include one or more elements such as control of external stimuli (vestibular, auditory, visual, tactile), clustering of nursery care activities, and positioning or swaddling of the preterm infant." (Symington

& Pinelli, 2001, Online, *Cochrane Review*). Developmentally supportive care (hereafter, called DSC) also stresses the importance of the relationship of the infant within the family. Therefore, family-centered care (FCC) is an integral part of the child's development, and for that reason needs to be incorporated within the caregiving model in the NICU (Kenner, 2000, Online). The prominence of family-centered care has evolved the term, "developmental care," into more descriptive nomenclature, IFDC, "individualized family-centered, developmentally supportive care" (Turnage-Carrier, 2002, p. 27).

For the purpose of this study, the term "developmentally supportive care" (DSC) will include the individualized care of the infant, the care of the caregivers, including family and NICU staff, and the care of the environment surrounding the infants, the families and the NICU staff. For the purpose of this study, DSC will be practiced within the context of family-centered care, i.e. the needs of the family will be considered and incorporated in support of the infant's care. Additionally, DSC will be practiced within the context of environmental care.

The Problem

In spite of the support of leading neonatologists and clinical nurses and the results of research, application of procedures to prevent developmental problems has been inconsistent at best and at times not considered a priority in some NICUs. Robison (2003) pointed out, "without consistent leadership and clear accountabilities, developmental care will depend on the individual philosophy, or even the mood, of the health care

professional at the bedside," and "infants and families (will) experience an unpredictable and inconsistent quality of care" (p.379).

The lack of consistent participation in preventive procedures may cause one to conclude that sustaining the less obvious "quality-of-life" for the premature neonate falls under the developmental, environmental, and social disciplines rather than under the medical realm, which concentrates on the blatant issue of survival. This is not to chide the medical profession for its priorities. Certainly without survival there would be no need to be concerned with the development of the neonate. Neither is this an issue of lack of concern on the part of medical professionals. Thigpen (2002) described the initial care of the newborn as "preserving function and supporting physiologic processes while the infant makes the transition from fetal life to the neonatal state" (p.21). She pointed out that after the initial intervention and stabilization, a therapeutic environment and course of support is established.

In discussing the "nature of nursing," Chinn and Kramer (1995) described the "interpersonal nature of nursing practice" as it is distinguished from medicine. "Medicine focuses on surgical and pharmacological interventions with interpersonal interactions secondary" (p.41). On the other hand, nursing primarily focuses on the interpersonal interactions with medical and technical interventions supporting it (p.41). A definition of the practice of nursing given by the National Council of State Boards of Nursing, Inc. (2006, Online) follows:

> The practice of nursing means assisting individuals or groups to maintain or attain optimal health, implementing a strategy of care to accomplish defined goals and evaluating responses to care and treatment. This practice includes,

> but is not limited to, initiating and maintaining comfort measure, promoting and supporting human functions and responses, establishing an environment conducive to well-being, providing health counseling and teaching, and collaborating on certain aspects of the health regimen. This practice is based on understanding the human condition across the life span and the relationship of the individual within the environment (p. 1).

Coupling this definition with the explanation of Chinn and Kramer and with the initial intervention described by Thigpen, it seems natural that DSC would fall under the guidance of nursing practice in the NICU.

This discussion raises the phenomena of "turf issues" as related by Carole Kenner (2000), Manager of Education and Programs for the National Association of Neonatal Nurses (NANN). She pointed out that some physicians have commented, "Developmental care is just another way nurses think they can control the environment and dictate orders" (Kenner, 2000, Online). Although this is not the outlook of most, it does raise awareness that DSC, as a means to provide best practice, can be a divisive issue.

In spite of the differences in foci of medical and nursing interventions, DSC is a method of caring that should be a transdisciplinary function of best practice in the NICU. It should be sanctioned as a gentler way to provide care by all disciplines as well as family caregivers. The National Association of Neonatal Nurses (NANN) addressed this aspect as it seeks to promote DSC among medical and nursing staff in the NICU (Kenner & McGrath, 2004; Kenner, 2000, Online).

What is the problem in providing consistent, managed DSC? The issue is: On-the-job training and management in the application of positive clinical research is necessary for NICU personnel so that best practice is provided for effective developmental outcome of the infants. For the purpose of this study, "best practice" in the area of developmental care is defined as "developmentally appropriate, research-based, available, and teachable techniques" for use by staff and parents in the care of the neonate. This definition for "best practice" is adapted from Zemelman, Daniels, and Hyde (1998). However, responsibilities of keeping up with medical, technological, and pharmaceutical advances leave little time for NICU staff to review the monthly literature in order to become knowledgeable in the latest techniques in DSC. This is the reality, even though the adoption of developmental practices has been declared to improve developmental outcomes for individual infants (Als et al., 1986; Als et al., 1994; Becker, Grunwald, Moorman, & Stuhr, 1991; Fleisher et al, 1995; Lotas & Walden, 1996).

Additionally, there is an elite attitude among proponents of particular methods that healthcare professionals need long-term training in order to function as developmental caregivers. This attitude has proved detrimental in advancing the benefits of developmental care to infants and families. Administrators and neonatologists have not justified subsidizing money and time to send nurses for extensive training based on studies in which populations were small, even though data have been very encouraging. Appeals for evaluation of and recommendations for implementation of DSC have been positive (Graven, 1999; Merenstein, 1994).

Some NICUs desiring to offer best practice and having the means, have a multidisciplinary team trained in the Newborn Individualized Developmental Care and

Assessment Program (NIDCAP®) (Als, Online, 2006; Tribotti & Stein, 1992). Recognized as a seminal model supporting individualized developmental care, NIDCAP® has not been a budget priority for every NICU. This is due to the expense, the typically five-year implementation process, one-year training for each of the team members, the ideal minimum number of five trainees per NICU, and the amount of dedicated observation time by each trainee required to practice NIDCAP® observation skills. Each trainee must observe and give written reports on approximately 24 infants for 200 to 400 hours (Als, Online, 2006). Although proponents have downplayed the expense by pointing out the savings in medical costs, decreased length of hospital stay, and prevention of medical sequelae for premature infants, NICU administrators may have difficulty justifying these monetary and staff-time costs when they are facing decreases in medical care revenues (Ashbaugh, Leick-Rude, & Kilbride, 1999). Administrators have not based their misgivings on costs alone. They are concerned that studies in developmental techniques have not used large enough samples to substantiate their findings, evaluated them, or completed follow-up studies to warrant the investment of money and time (Peters, 1999; Symington & Pinelli, 2001). In an evaluative review of the literature on infant handling in the NICU, Dr. Kathrine Peters determined that "there are limited randomized trials in addition to a diversity of outcome variables in this literature set" (1999, p. 84). Dr. Peters acknowledged design issues in the low number of infants used as well as threats to internal validity in most of the studies she reviewed on infant handling (p. 86). These issues may explain why investments in developmentally supportive care have not been encouraged or forthcoming by some administrators.

A conclusion may be drawn that non-availability of NIDCAP® to a large number of NICUs has kept this model somewhat limited in the loop of best practice. Dr. Peters pointed out that although many health care providers consider NIDCAP® to be the only program to provide individualized developmental care, "given the definition of developmental care, this is surely not the case" (Peters, 1999, p. 99). Heermann and Wilson (2000) reported the growth across the country in structured programs of developmental and family-centered care. However, Robison (2003) stated, "variability and inconsistency remain in the quality of experience for infants and families in the NICU." Furthermore, this "may reflect the origins of developmental care as a *grassroots* effort" (p. 379).

A concern expressed by Kenner (2000) is that some professionals might be reluctant to use developmentally supportive care because it is individualized. Where they had learned to "conform to the rigid hospital schedule," (Online) they now had to be aware of the infant's cues and the family's needs, thus, adjusting their schedules accordingly. This is not to downplay the importance of individualized DSC as best practice. It is to acknowledge a possible link to lack of consistent use by some NICUs. Perhaps there would be an increase in managed DSC if staff understood the value and if leadership in administration and management would promote expectation.

Ashbaugh, Leick-Rude, and Kilbride (1999) developed a questionnaire to gather data regarding staff membership, utilization, education and training, and funding of developmental care teams. Thirty-one of fifty NICUs responded, representing NICUs in eighteen states. Results "validated an intense interest in developmental care" (p. 48). However, the study also stated, "approaches to initiating and maintaining developmental

care programs are not well established" (p. 50). The Ashbaugh review found that most of the surveyed NICUs "reported program development significantly different from the NIDCAP® program." (p. 52). It suggested additional investigation of these interventions to determine the clinical and financial impacts.

Benefits have been reported by some NICUs, which expanded their own developmental care practices based on reviews of the research literature, support of informed administration, and use of their own resources (Becker, Grunwald, Moorman, & Stuhr, 1991). The literature reported the interest of NICUs in developmentally supportive care and their willingness to pursue what is perceived as best practice in the principles of developmental care (Peters, 1999, p. 99). In some NICUs, developmental research has been presented in an in-service format, at times with no mandate or protocol, access to materials, or follow-up.

Taking a proactive approach, Children's Medical Ventures, Inc. is a medical equipment supplier that offers its products as well as developmental information and support to hospitals and NICU staff. With access to several practicing professionals in clinical settings as consultants, Children's Medical Ventures, Inc. is able to set up advance teams to teach research-based developmental techniques through paid workshops. This company develops and field-tests its products with active clinicians, using their advice to improve, to market, or to remove the product. Hospitals and NICU staff can order materials that are clinically tried with developmental support for their premature or sick infants as key. In conjunction with their products, the educational approach used by the Wee Care Neonatal Systems Training Program of Children's Medical Ventures documented an enhanced program in DSC with positive medical

outcomes (Hendricks-Muñoz, Prendergast, Caprio, & Wasserman, 2002). They determined the barriers to continuation in offering developmental care are: staff attitude toward change; concern of medical personnel that DSC might "interfere with their philosophy of provision of care"; perception of importance, or lack thereof, for the program; and incorporation of developmental care into practice routines (p. 44). Some NICUs have chosen to accept the Children's Medical Ventures approach, which covers best practice standards as defined above: i.e. developmentally appropriate, research-based, available, and teachable techniques to access developmental care for their patients. NICUs have the choice to purchase or not to purchase the materials.

Summary of the Problem

One can conclude that overall advancement in the field of DSC in the NICU has been somewhat suppressed because of the issues discussed above: lack of time to stay abreast of the developmental research; elitism, including turf issues; weaknesses in research design of developmental studies; and, lack of support from administrators who make decisions based on a combination of fiscal responsibility and clinical outcomes of well-designed research. Additionally, in order to individualize care to infants and their families, staff members may be reluctant to change their present practice because they would have to break away from the rigid schedules that they had been trained to keep. Finally, developmental techniques may not be available to some NICUs due to lack of resources, leadership, or opportunities to acquire teachable techniques.

In spite of these issues, the Ashbaugh survey, the Becker research, annual conferences to collect and disseminate DSC techniques, and independent studies support

the high interest level and overall consensus of caregivers in the NICU in the desire to promote DSC as best practice. Dr. Peters (1999) called for research that addresses procedural assessments using sufficient subject numbers and appropriate designs. Also, she encouraged communication among professionals and families within and throughout other NICUs. Education of appropriate methods of using developmentally supportive techniques, documentation of research studies, and dissemination of results are necessary for NICU professionals to validate DSC (p. 99). This in turn will promote best practice in techniques that are developmentally appropriate, research-based, available, and teachable.

Purpose of the Study

This study addressed the need for managed and documented DSC within the new level three, state-of-the-art 63-bed Newborn Intensive Care Unit at Magee-Womens Hospital of the University of Pittsburgh Medical System (UPMC), Pittsburgh, PA. In order to address the issue of a lack of consistent DSC within the NICU, there was a need for a vehicle for learning "the why" as well as the procedural protocols of managing developmentally supportive techniques. There was a need for nurse clinicians to model procedures to staff on a case-to-case basis, addressing individual infants and their families. There was a need to be aware of and to provide support and ambience within the environment.

In order to address the documentation issue and to establish baselines in DSC, there was a need for an instrument that could measure the levels of use of developmentally supportive criteria, which are proposed in the research literature. This instrument should have two major purposes: (a) within the microsystem of the NICU, it would provide the

needed documentation to help staff to determine its level of correct procedure and to manage its use of developmentally supportive techniques on a large number of patients, and (b) within the macrosystem of developmental research studies, it would provide a population number and a baseline to help confirm/denounce the merits of using a particular developmentally supportive technique, as well as the benefits of using an overall developmentally supportive program. Further, the instrument should be user-friendly requiring minimal training on a wide-scale, thereby making it virtually available to any NICU. This would address the management of standards of best practice: making the instrument, as well as its techniques, developmentally appropriate, research-based, available, and teachable.

Based on the needs addressed above, the purpose of this study was twofold: (a) to determine if the facilitation of a learning organization among clinical nurse leaders, who are nurse practitioners in a NICU, will affect the level of use of developmentally supportive care techniques by staff in the NICU, and (b) to test the validity and reliability of an instrument that purports to measure the levels of developmentally supportive care in the NICU. The instrument, *Checklist for Observing Developmentally Supportive Care in the NICU*, was developed for this study. It consists of 17 research-based developmentally supportive techniques. It was used to measure the level of management of developmentally supportive techniques pre- and post intervention of the facilitation of the learning organization.

The general purpose of this study was not only to provide best practice in care for the infants and their families, but also to improve the professional well being of this staff. It is unarguable that intensive care, particularly of infants, is a stressful profession. Best

practice methods that will help improve clinical outcome and nursing skills, thereby the esteem, of the caregivers (NICU staff as well as parents) will benefit the medical system. The improvement in quality of managed care by offering best practice techniques, and the improvement of satisfaction of caregivers and consumers, are in line with the goals highlighted in the Transformational Model for Professional Practice in Health Care Organizations developed by Dr. Gail Wolf, coordinator of nursing leadership, University of Pittsburgh, and former senior vice president and chief nursing officer, University of Pittsburgh Medical Center (UPMC) (Shields Arnold, L. 2001). The Transformational Model encourages caregiving frameworks that address the need of healthcare systems in today's economy. The present study presents a framework, i.e. an intervention strategy that may be replicable at other NICU sites at costs that are controlled by their own learning organizations' or administrators' decisions. Further, data collection at a NICU site will provide valuable information upon which informed decisions about DSC techniques may be made. Collection and tracking DSC data on individual infants could demonstrate that DSC not only is best practice, but also that it is fiscally sound in the reduction in costs and in patient hospital length of stay.

Need for the Study

Best Practice

It is not enough to inform a NICU medical staff of best practice techniques. This was demonstrated informally at the 1999 international conference of neonatologists, researchers, and NICU staff, *The Physical and Developmental Environment of the High-Risk Infant*, Clearwater Beach, Florida. Stanley Graven, MD, Neonatologist and

Professor, University of Southern Florida, requested a show of hands of the 360 conference participants of this paraphrased question: Who is a proponent of developmental care in the NICU? Within the room, everyone raised his/her hand. Dr. Graven's next question (paraphrased) made the point of the conference's opening remarks: How many of you are from a NICU that uses developmentally supportive care consistently? There was a show of less than ten hands. Dr. Graven noted that some of these might even have been from the same NICU (Graven, 1999).

This informal survey emphasized the need for a way to promote the consistent use of developmentally supportive care through managed care as best practice in the NICU. The conference, which focused on various elements of a developmentally supportive care program and their importance to infant development, concluded with a challenge session dealing with the aspects of "change" within an organization (Browne, 1999).

At that conference and at subsequent conferences held in 2000 through 2005, medical personnel in attendance voiced their call for: (1) a development of strategies for a change process in the NICU, including assessment, implementation, and evaluation; and (2) an integration of developmental principles into practice in the NICU (1999-2003 conferences, *The Physical and Developmental Environment of the High-Risk Infant*; Browne, J., 1999). The need for change strategies in the NICU has been addressed in the literature (Milford, Zapalo, and Davis, 2001).

In spite of the positive results reported in the literature regarding individualized DSC, there is no teaching model that is universally accepted as the standard in the neonatal field to place intervention methods into managed practice in the NICU. There is a need to place beneficial developmental research findings into immediate practice with

minimal expense. Clinical nurse leaders must assume the responsibility to act as change agents and to model applications to NICU staff.

Assessing Elements of Best Practice

Currently, there is no instrument accepted widely that measures the levels of developmentally supportive care or the management of its use within a NICU. Arguably, individualized care must be just that—individualized. However, there are developmental techniques that can be used NICU-wide in every environment. These have been delineated from the research literature and are enumerated in the *Checklist for Observing Developmentally Supportive Care in the NICU*, which was developed for this study. Briefly, these techniques include lighting control, noise abatement, positioning techniques, and reading infant cues to cluster caregiving. Other techniques that may acknowledge individualized medical or familial exceptions are the use of pacifier, breast-feeding, kangaroo care, and co-bedding. Encouraging the family to respond to the infant's needs through its caregiving is an integral part of DSC. The use and the level of each of these techniques can be observed and measured. Measurement would provide a way for NICUs to assess and to manage their own practice of developmental techniques. There is a need to establish DSC as managed practice so that measurable outcomes will confirm and generalize the positive effects on a wide-scale supported by research at different sites; or, possibly will denounce the merits of specific techniques.

The rationale for using the *Checklist for Observing Developmentally Supportive Care in the NICU* to measure criteria selected from the research literature was twofold: (a) to cover a wide area of criteria that define some of the parameters of DSC; and, for

this particular study, (b) to allow the learning organization to select the criteria of concentration (i.e. the developmental techniques on which to focus an action plan). By a functional definition of a "learning organization," its direction must be determined by its membership, not by a mandate from administration or an outside source. It must have "generative learning," which "enhances (the) capacity to create" (Senge, 1994, p. 14). In this study, the learning organization was given the opportunity to select its criteria of concentration for improving DSC. The group directed time spent on developing strategies to improve specific techniques.

Ethical Considerations

A systematic approach to application of DSC would affect the quality of life for many infants who begin their lives in need of intensive care (Cvetnic, 1999). "Length of hospitalization is directly related to the infant's ability to gain enough weight to reach discharge weight criteria; thus promotion of growth is a primary goal of neonatal care" (Brandon, Holditch-Davis, & Belyea, 2002). The literature reported that developmental care promotes growth of the neonate and results in fewer days infants need to spend in the hospital (Als, Lawhon, Duffy, McAnulty, Gibes-Grossman, & Blickman, 1994). Therefore, a program that encourages managed use of individualized DSC would be cost effective for the health care industry as well as for the families whose expense is measured not only monetarily, but also physically and emotionally.

The detrimental effects of long-term separation on parent-infant bonding and future psychological adjustments within the social context have been documented in the classic study reported by Klaus and Kennell (1976). DSC addresses these issues by the

encouragement of attachment through kangaroo care, breast-feeding, reading of and responding to the infant's cues, and co-bedding in the case of multiple births. Although these issues have been presented in the literature and at conferences, a practical way is needed to incorporate, document, and manage these family-centered techniques in the NICU.

On an ethical basis, medical professionals are entrusted to use best practice in the care of their patients. A critical review of the research supports DSC as best practice for neonates and for their families (Graven 1999; Merenstein, 1994). With the knowledge that it is providing the best possible care to patients within a developmentally supportive environment, the medical staff is validated and simultaneously comforted in this oftentimes-stressful profession (Burger, personal communication, July 9, 1999).

Theoretical Framework for the Intervention

The intervention portion of this study, i.e. the initiation of a learning organization, was approached from theoretical foundations in several distinct areas: (a) Social learning theory serves as a basis in a community of healthcare providers who work closely together on resolving problems for their shared patients. (b) Change theory was examined in light of the organizational culture. Organizational culture contributes to success or failure in organizational change and the development of a learning organization. (c) Adult learning theory was a practical foundation for facilitation of the education of a staff that must learn and understand the reasons for DSC. (d) A learning organization was a vehicle in which the elements of social learning, the dynamics of change, and the education of adults would contribute to an increase in staff knowledge resulting in a plan of action. (e)

Finally, for the basis of DSC, the classic Synactive Theory of Development (Als, 1982) as well as specific researched techniques of DSC that address the individual needs of the infant were reviewed. These techniques of DSC were used in the formulation of the observation tool for this study.

Social Learning Theory

Skills in practice are often learned through observation of models and through the application of that knowledge in the analysis of a new situation. The theories of Alfred Bandura and Kurt Lewin are compatible in addressing social learning. In developing a practical approach to the application of DSC, the dynamic interaction of the competent personnel in the NICU was affected by an approach described by the much-cited Social Learning Theory of Bandura. According to Bandura, "human thought, affect, and behavior can be markedly influenced by observation, as well as by direct experience" (Bandura, 1977, p. vii). Social responses are learned by observing the actions of others. In this study, modeling played a definitive role in teaching procedures to NICU staff. Bandura stated, "Some complex behaviors can be produced only through the aid of modeling…Even when it is possible to establish new behaviors through other means, the process of acquisition can be considerably shortened through modeling" (pp. 12-13).

Change Theory within a Learning Organization

Lewin's archetypal Change Theory emphasized the dynamic process of change. Within his model, the process of change can be categorized into stages (Lewin, 1947, p. 228). The learning program can be structured around the needs of the learners as they

proceed through the stages of change. Understanding this dynamic process facilitated the planning to meet the needs of the NICU staff. An in-depth analysis of change theory is addressed in Chapter II, The Literature Review.

Dr. Edgar Schein, professor emeritus at the Massachusetts Institute of Technology, Sloan School of Business Management, considered his model of learning and organization development around the process of change. Notably, Schein's model in change management supports Lewin's Change Theory. Schein's model was an excellent structure to reference when promoting change in the NICU. Teaching about the dynamics of change, monitoring the change process, facilitating change through consulting and coaching, using dialogue, and developing an awareness of the needs of the staff are elements used by Schein that were incorporated into the learning modules (Schein, Online, 2006).

Adult Learning Theory

Also known as andragogy, adult learning is a philosophical orientation, which needs to be taken seriously by teachers of adult education (Nielson, 1992). This approach assumes that the adult shares the responsibility of his/her learning in contrast to the pedagogical model, which places the responsibility of learning extrinsically, on the teacher and the content of material, as defined in classic literature by Knowles and Associates (1984). Andragogy dovetails with the responsibility assumed by members of a learning organization, in that they select the areas of emphases. The teacher is the facilitator for the organization.

Since the NICU Learning Organization consisted of clinical nurse leaders determining ways to model to adult staff, it was necessary to examine how adults learn. The developmental stages of the adult staff were considered and were examined briefly within the learning modules of this study. The clinical nurse leaders discussed differences in developmental life stages of staff members and the effect that this had on staff training, scheduling, and experience in handling situations. It was obvious that they were already attuned to making adjustments for personal factors, which influence critical behaviors, as addressed by Bandura (1977). This is explored in Chapter II, The Literature Review. Also, the clinical nurse leaders' understanding of developmental life stages was helpful in the discussion of serving parents at different life stages that are going through traumatic adjustments with the birth of a premature or ill child.

Malcolm Knowles (1980), a principal proponent of adult learning theory, developed the andragogical model. It is interesting to note the parallel construct to Bandura's social learning theory, which preceded it by less than a decade. Knowles' model is process-oriented and places the interactions of environment, personal factors, and behavior, as discussed by Bandura, into an actionable format. Within a framework of seven elements, Knowles' first step sets the environmental climate, both physically and psychologically. He continued with the personal involvement of the learner in a self-directed process which includes the following: planning, diagnosing needs, forming learning objectives, designing and carrying out learning plans, and evaluating (Knowles, 1980). Knowles' framework is examined in Chapter II, The Literature Review. Comparing and contrasting his theory with other research aided the development of a practical model for use in this study.

Learning Organizational Theory

An understanding of social learning theory, change theory, and adult learning theory contributed to the development of the learning organization within the NICU. Peter Senge reviewed much of this information in his 1990 (1994, Rev. ed.) classic work, *The Fifth Discipline: The Art and Practice of the Learning Organization*. Within this book, as well as within *The Dance of Change* and pragmatic follow-up field books, is a collection of dynamic theories and practices from experts in leadership positions from ancient to current times. Senge arranged this collection into an organized framework of a practical holistic approach, a systems approach. Senge's description of systems thinking as the "cornerstone," the "fifth discipline" underlying his delineation of five learning disciplines, will be defined further in the Literature Review. Systems thinking underpinned the process of pulling the dimensions of social learning, change, adult learning, and the practice of developmentally supportive care into an actionable NICU learning organization.

Developmentally Supportive, Family-Centered Care

Koch (1999) stated that "Developmental support in the NICU integrates the developmental needs of infants with intensive medical care." (p. 522). She acknowledged two equally important components of developmental support: (a) understanding the infant's developmental needs by reading his/her "cues" and (b) recognizing "the family as an equal and highly respected member of the health care team."(p. 522).

It was the integration of these through specific techniques within the supportive environment that advanced the foundation of understanding for the learning organization

in this study. Interweaving the research literature with experiential accounts of the clinical nurse leaders built the essence of developmental care as defined by this particular learning organization. Suggestions for intervention resulted.

An interactive definition of developmentally supportive care in the neonatal intensive care unit has been promoted by Dr. Heidelise Als, and associates in their work over the past twenty-five years. As stated by Als at a 1993 neonatal conference in San Francisco, "Developmentally supportive newborn intensive care has been defined as a professional alliance, that supports the parents' engrossment with their child and the child's neurobiological based expectations for nurturance from the family, an alliance that listens to the language of the infant's behavior and uses the dialogue between the infant, family and professional caregiver to guide care." (Als and Gilkerson, 1997).

DSC and its techniques are based on the Synactive Theory of Development, developed by Heidelise Als (1982). It considers the individuality of each infant within its environment and within its family. Further discussion of the Synactive Theory is in Chapter II, The Review of the Literature. A succinct yet encompassing definition by deLestard and Lennox (1995) stated, "Developmental care is a common-sense, humane approach to meeting the needs of premature infants and their families." (p. 23).

Summary of Theoretical Framework for the Intervention

The profound definition of developmental supportive intensive care by Als encompasses the essence of a systems approach to the developmental care of the infant, i.e. we are all active participants in shaping the reality of the present to creating the future (Senge, 1994, p. 69). This system involves the unique interactions between the infant and

parents, the infant and professional caregivers, the parents and caregivers, and among the caregivers themselves. It is the recognition and appreciation of this system within the context of the NICU environment that determines the level of supportive care and, in turn, affects the well-being and development of the infant.

The Problem Investigated

Neonatal developmental outcome points to a need for a practical systemic approach to place research-based developmental procedures into application by staff in the NICU. An observation tool to assess the use of developmentally supportive techniques was developed to measure the level of use of these procedures. It provided a baseline for examining what needed to be changed to provide DSC as best practice. The baseline pre-intervention observation was compared to a post intervention observation, each measured on the *Checklist for Observing Developmentally Supportive Care in the NICU.* This study used the pre- and post observation results to establish the effects of the intervention, a learning organization, on the levels of DSC in the NICU.

Specifically, this research addressed the following questions:

1. Can an instrument based on developmental research and on input from practitioners in the NICU, reliably and validly measure the levels of use of specific developmental criteria in the NICU?
2. As measured on the *Checklist for Observing Developmentally Supportive Care in the NICU*, is there a relationship between the levels of use of developmentally supportive care procedures by the NICU staff pre- and post intervention (the formation of a learning organization)?

Hypotheses

Research Hypothesis 1: The *Checklist for Observing Developmentally Supportive Care in the NICU* is an instrument that reliably and validly will measure the level of use of specific developmental criteria in the NICU.

Research Hypothesis 2: As measured on the *Checklist for Observing Developmentally Supportive Care in the NICU*, there will be a significant difference between the level of use of developmentally supportive care techniques by the NICU staff pre- and post intervention, dependent upon the time spent on the criteria of selection by the learning organization.

Note: "criteria of selection" are the developmental techniques, on which the learning organization chooses to concentrate for the purpose of improvement of staff performance through an action plan.

Delimitations

1. This study took place in the 63-bed, level 3 NICU at Magee-Womens Hospital of the UPMC Health System, Pittsburgh, PA.
2. Collection of data occurred during daytime hours, between the hours of 9:30 a.m. and 8:10 p.m. This time covered change of shifts as well as the times for increasing or decreasing the lighting to adjust for diurnal patterns.
3. Ethically, the staff had to be informed that the NICU rooms were being observed for DSC, therefore, there was a possibility of the Hawthorne Effect. However, it must be noted that since Magee-Womens Hospital is a teaching hospital, staff is comfortable with students/trainees observing. Staff may have continued with its level of care without adjustment.
4. Although the order of sampling was randomized, inclusions were made for feeding and caregiving. In a clinical setting, convenience sampling is

appropriate. Therefore, when feeding or caregiving was occurring, those environments were immediately observed. This was done in order to insure that there was a large enough sampling size of these particular criteria.

5. Criteria listed on the *Checklist for Observing Developmental Care in the NICU* are not all-inclusive of DSC. The criteria were selected because they broadly cover the developmental needs of all infants. They have been peer-reviewed and validated by three physicians and three clinicians in the neonatology field (listed in Chapter III). Discussions and changes made according to their professional advisement mitigate the question of the appropriateness of criteria and of item presentation on the forms.
6. On the *Checklist for Observing Developmental Care in the NICU,* the levels of criteria are specific in nature so that selection of the appropriate ratings was less problematic for the raters.
7. The two raters were selected on the basis of professionalism and recommendations as developmental specialists. Both have Master in Education degrees with emphases in Early Intervention and Bachelor of Science degrees in Child Development.
8. The objectivity of the raters was addressed in the two training sessions. The raters practiced rating separately but in the same room at the same time as the trainer, the Principal Investigator. A comparison of results occurred immediately after completing each rating of a bed space. Results were discussed with one another and with the trainer during the training sessions.

9. The collection of abundant data mitigated the effect of individual nuances of practitioners.
10. Incorporation of a "no score" value mitigated the effect of individual needs of specific infants due to medical or family cultural issues. This allowed for individualization, a major premise of developmentally supportive care. The "no score" value was given to infant care of those who are medically exempt from Kangaroo Care, co-bedding, or breastfeeding. Values of "no score" were available for infant care of those who were not co-bedded or not given the pacifier due to familial/cultural choices.

Limitations

1. Individual nurse clinical nurse leaders may have varying effects on the training of staff. To mitigate this threat to validity, emphasis was placed on the importance of adopting protocols or standards of procedures for modeling. Discussions addressed experience with the procedures and how to model them correctly.
2. Scheduling constraints made it difficult for nurse clinical nurse leaders to meet as a whole group. To mitigate, a standard report form, specifying procedures emphasized, literature review, and discussion points were shared among groups. The Principal Investigator facilitated the sharing of discussion points and concerns expressed at other meetings. Meetings were set for times that accommodated the clinical nurse leaders' schedules. There was an average of two or three meetings per week to cover all of the clinical nurse

leaders. There was one meeting at the end of the six-week period where all clinical nurse leaders were present. Discussions and suggestions were summarized prior to and at that meeting.

3. Since the meetings of the learning organization took place over a six-week period, vacation time could not be avoided. There was one missed meeting by each of eight clinical nurse leaders. The report form was used to individually share the missed information with each nurse. Due to scheduling constraints, one clinician was unable to attend any meetings. A summary of each meeting was discussed with her and her input was incorporated into the summarized suggestions.
4. There was the possibility of statistical regression on the part of the raters between pre- and post intervention. This was mitigated by a retraining session prior to the post intervention data collection.

Definition of Terms

Bed space – the immediate area surrounding an infant including diaper, clothing, the positioning tools, the bedding, the bed, and square footage around the bed within the individual infant room or within the confines of the curtained area.

Best practice(s) – efficient and effective care, which includes "developmentally appropriate, research-based, available, and teachable techniques" (adapted from Zemelman, Daniels, & Hyde, 1998).

Developmentally supportive care, DSC, developmental care, individualized developmental care, individualized family-centered care – caregiving that considers the individual needs of the infant to address his/her developmental potential. It encapsulates the family's and caregivers' needs as a function of providing support to the infant and adjusts the environment and caregiving techniques accordingly.

Clinical nurse leader – nurse clinician with significant experience, responsible for being a model and leader in patient care.

Cluster care – performance of several care activities in a single visit or disturbance to the infant for the purpose of minimizing handling time and maximizing rest time (e.g. diaper changing, taking temperature, a medical procedure, feeding, etc.). The appropriate use of cluster care in DSC is to be attuned to the infant's cues and to interrupt caregiving for containment of the infant if needed.

Containment – physical support of the infant with the caregiver's hand(s) or positioning the infant so that s/he can rest or collect and organize self. This supportive action should be used when handling or feeding the infant or when performing a medical procedure.

Environmental support – care that defines the individual needs of the infant within the confines of its immediate surroundings. This refers to the systems that interact with the infant, i.e. the set of objects, events, or conditions that is not part of the infant, but has a bearing on the infant's functioning (adapted from Gilles, 1994, p. 66).

Family-centered care – consideration, encouragement, support, and inclusion of the family's input and active cooperation according to its ability in the care of the infant.

Individualized care – care that evaluates and supports the patient with regard to his/her personal needs and cues.

Infant's cues – Body language or visceral responses of the infant that show his/her reactions to environmental stimuli.

NICU – neonatal intensive care unit or newborn intensive care unit.

Systems thinking – a framework for seeing interrelationships (Senge, 1994, p. 68).

Summary

Even though the literature reports that developmentally supportive, family-centered care is best practice, neither traditional in-service methods nor planned programs have resulted in the managed use of these techniques as a standard in all NICUs. This study examined the effect of an organizational learning paradigm, directed at the clinical nurse leaders ($N = 9$), on the advancement in the managed use of DSC by NICU staff.

Based upon research literature of developmentally supportive techniques, an instrument was developed to measure the levels of DSC. From its inception to its clinical use, the *Checklist for Observing Developmentally Supportive Care in the NICU* followed several basic tenets to establish validity and reliability. The rationale for the instrument's

ability to measure the 17 criteria selected from the research literature was twofold: (a) to cover a wide area of criteria that define parameters of DSC, and (b) to allow the selection of the concentration area(s) by the learning organization. By a functional definition of a learning organization, its direction was determined by its membership, not by a mandate from administration or an outside source.

This program was designed to promote change in practice through a systems approach using the clinical nurse leaders to model, to provide support, and to encourage and problem-solve through the use of reflection, dialogue, and discussion within the Newborn Intensive Care learning organization. Measurable levels in observable developmentally supportive practice collected pre- and post intervention by trained raters using the *Checklist for Observing Developmentally Supportive Care in the NICU* determined the DSC level of each criterion. Data were analyzed to determine whether or not the educational intervention through facilitation of the learning organization had an effect on the level of DSC by the NICU staff.

CHAPTER II

THE LITERATURE REVIEW

Introduction

In light of the challenge of the international conferences, *The Physical and Developmental Environment of the High-Risk Infant* (1999-2003), and for the purposes of this study, the literature review covered these distinct, yet interdependent areas: (1) Change Theory, (2) Social Learning Theory including organizational learning, adult learning, and teaching strategies, and (3) individualized developmental care of the neonate, including the Synactive Theory of Development, family-centered care and environmental support. The following rationale for reviewing each of these areas supports the necessity.

Understanding the process of change lays the theoretical foundation for change within an organization. Once it is determined where the members of the organization are located in the process of change, they are able to move forward, applying strategies of reflection and dialogue within context. The practice needs to become part of the organizational culture.

A review of the literature about Social Learning Theory and organizational learning helped to formulate a basis for effective facilitation of the change process. Reflecting upon the effect of a staff member's developmental level on his/her receptivity to learn, clinical nurse leaders were able to determine the best way to model to their staff within the culture of the NICU and within the context of the vision of the NICU.

Finally, a review of the literature on individualized developmental care of the neonate substantiated the benefits, the "why" this is best practice. This review also

explained the techniques of the developmentally supportive care program, which includes environmental support, individualized supportive care, and family-centered care.

Although these reviews were distinct, consideration was given to their interrelation. The approach to the study was systemic. The population that will benefit from the study is threefold, yet a dynamic system within the NICU: (1) the infants, (2) the families of the infants, and (3) the NICU staff.

Review of the Literature on Change Theory

Historical Overview of Change Theory and Related Research Literature

Social change occurs within an existing human system. In his early works, Dr. Edgar Schein identified it as "the induction of new patterns of action, belief, and attitudes among substantial segments of a population" (Zaltman et al., 1977, p. 8). In an online definition, Schein (2006) demonstrated the evolvement of change theory as he has come to know and use in his research of cultures in learning organizations. For either individual or group application, Schein stated that human change is "a profound psychological dynamic process that involved painful unlearning without loss of ego identity and difficult relearning as one cognitively attempted to restructure one's thoughts, perceptions, feelings, and attitudes" (p. 2). He identified this within the context of Kurt Lewin's classic model of the Theory of Change, of which Schein is a proponent.

Kurt Lewin's Theory of Change.

Kurt Lewin is referred to as "the father of modern change theory" because his theory is most often used as a foundation for change in many organizations (Harvey, 1990, p. 17). Its simplicity and truth in describing observable phenomena has allowed others to build or to superimpose their models of change on it (Havelock, 1995; Lippitt, Watson, & Westley, 1958; Schein, 1997). Although the three-step model is easily followed, Lewin's deductions within the social science and mathematics realms leading to its development were very involved. His well-documented basis guides the reader through the logical progression of understanding the principles of change to the three-steps that form the foundation that is widely used. These steps are "Unfreezing, Moving, and Freezing of Group Standards" (Lewin, 1947, p. 228). The third step, "freezing of group standards," has been renamed "refreezing" by most subscribers to Lewin's theory. This description is in line with Lewin's discussion of change: "In…bringing about a desired state of affairs, one should not think in terms of the 'goal to be reached' but rather in terms of a change 'from the present level to the desired one" (p. 224). "Refreezing" accurately describes this process.

According to Lewin, unfreezing group standards must sometimes be accompanied by a stirring up of emotions to break up the quasi-stationary equilibrium characteristic of an organization embedded in its social habits (p. 229). "Quasi-stationary equilibrium" refers to the state in which the social system is cohesive and thereby resistant, acting as a barrier to outside influences (Havelock, 1995, pp. 46-47). Lewin described the necessity of dealing with "complacency and self-righteousness" within people. Causing

disequilibrium to the situation creates a motivation of the organization toward a change to try to reestablish equilibrium.

Lewin explained that the difficulty introducing change lies in the "well-established 'custom' or 'social habits'" (Lewin, p. 224) of the organization. These are considered obstacles to change that supply an inner resistance. In a similar description, Schein (1997) included "habits of thinking," the "mental models" and "shared cognitive frames that guide the perceptions, thought, and language used by the members of a group" (pp. 8-9). He integrated these into one of several categories of phenomena, which he associated with the culture of an organization. He warned leaders to become conscious of the organization's cultures, or "those cultures will manage them" (p. 15).

Notably, in his analysis of learning organizations, Argyris (1999) theorized that organizational defense prevents the members of an organization "from experiencing embarrassment or threat, and at the same time, prevents them from discovering the causes of the embarrassment and threat" (pp. xiii-xiv). He stated that defensive routines are basically cover-ups and cover-ups of cover-ups. They are "anti-learning and overprotective" and he specified two possible ways to address them: single-loop and double-loop learning. Single-loop learning means "actions that produce errors are identified and changed." Double-loop learning occurs when questions are asked, such as: "How come the inappropriate" was "permitted to go on…?" (p. xiv).

Lewin stated that experience in social fields with leadership training has indicated that it is "usually easier to change individuals formed into a group than to change any one of them separately" (p. 228). In reference to the psychological concept, *quasi-stationary equilibrium*, Lewin argued that an individual dependent on a valued standard in the

organization has a "force field" corresponding to that amount of dependence. This force field acts as a resistance to change. If one succeeds in changing the valued standard of the group, the force field becomes facilitative to the change process in the individual (pp. 228-231).

In his discussion of the dynamics of change, Schein (1997) furthered this principle stating, "All human systems attempt to maintain equilibrium and to maximize their autonomy vis-à-vis their environment" (p. 298). Lewin suggested that the success of a workshop to effect change is dependent on the group forming its own subculture, away from the influence of the total group-at-large. This reduces the resistance to change as the individuals in the subgroup form their new allegiances (pp. 232-233).

Lewin stressed the effect of group decision on the "freezing" or "refreezing" process. He stated that an individual is more likely to make a choice or a decision on the basis of his/her membership in a group rather than on personal preference. Also, he pointed out the importance of *motivation* and *action* together in causing change. If members act on their decisions as soon as they make them, studies have shown that the commitment to change and to "freezing" in those decisions are probably linked to their commitment to the group. Lewin stated that a motivational lecture or a group discussion is not enough to activate change. Motivation and action need to be linked to cause change and the commitment to a group seems to affect the "freezing" of that change (p. 233).

Change Theory of Lippitt, Watson, and Westley.

Further support of Lewin's work is evident in the extension of his change theory by Lippitt, Watson, and Westley (1958). They expanded Lewin's three-step process into five general phases with the third phase sub-divided into three more sections. Thus, the final "Lippitt" model exists of seven phases within five general headings:

1. *Development of a need for change* (Phase 1)("unfreezing" according to Lewin). This problem awareness of "stress or disruption within a system or between a system and its environment" is the "disequilibrium" concept described by Lewin. A desire to seek change including outside help through a change agent is often the result (Lippitt et al., pp. 131-132).
2. *The establishment of a change relationship* (Phase 2). Lippitt et al. included the use of a change agent as a phase unto itself. They stressed that the relationship of the client to the change agent is critical to the success of the change (p. 133).
3. *Working toward change* ("moving" according to Lewin). This phase has three sub-phases:
    a. *The clarification or diagnosis of the client system's problem* (Phase 3, Lippitt et al., p. 134).
    b. *The examination of alternative routes and goals; establishing goals and intentions of action* (Phase 4). This phase calls for motivation and investment on the part of the client system (Lippitt et al., p. 135).
    c. *The transformation of intentions into actual change efforts* (Phase 5, pp. 136-137).

4. *The generalization and stabilization of change* (Phase 6) ("freezing" according to Lewin). Within this phase either a "spread or no spread" of the change occurs in the system or in neighboring systems. It is at this point that the "refreezing" occurs (Lippitt et al., p. 138).
5. *Achieving a terminal relationship* (Phase 7)

The authors referred to the need to plan for the ending of the relationship between the change agent and the system. Sometimes there is a need for a continued support system within the system. Sometimes the change agent is contracted to be available on a consultative basis. Careful consideration to this phase will not leave the system without support (p. 139).

Lippitt and associates extended Lewin's theory to emphasize the importance of the relationship and the action between the clients and the change agent. This model of change focuses on communication, building of rapport, and problem solving. Similarities to Lewin's theory are not only in the acceptance of the three steps by Lewin, but also in their emphasis of the link between motivation and action in Phases 4 and 5. Their stress on the dynamic role of the change agent in the motivation and the actualization of the action plan by the client are significant features of this model.

Everett Rogers' Diffusion of Innovations Model.

Everett Rogers' Model (1995) in the Innovation-Decision Process, theorized a process of change which follows the pattern:

1. *Knowledge*—first knowledge of an innovation of which an individual (or other decision-making unit) becomes aware

2. *Persuasion*—formulation of an attitude toward the innovation
3. *Decision*—adoption or rejection of the innovation
4. *Implementation*—placement of the new idea into practice
5. *Confirmation*—affirmation of the decision to adopt or reject (Rogers, 1995).

Rogers (1971) defined an innovation as any "idea, practice, or object perceived as new by an individual" (p. 19). Communication plays a profound role within each stage of this model. Rogers stated that social change is an effect of communication (p. 7). Diffusion, a special type of communication, is the "process by which innovation spreads to the members of a social system" (p. 12). According to Rogers, diffusion and social structure are "complexly interrelated" (p. 29). A principle of human communication is that if a source and a receiver are homophilous, that is alike in beliefs, values, education, social structure, etc., the transfer of ideas flows more frequently. The transfer of ideas has little flow in heterophilous relationships, where a culture is not shared (p. 14). These tenets are similar to those espoused by Lewin, Schein, and Lippitt and associates (hereafter called "Lippitt"), each of whom stressed the dependence of an individual's beliefs in the group's valued standard in the social system. In agreement with Lewin's model, Rogers (1971) stated that the characteristics of a particular social system influence the behavior of individuals in that system. He termed these influences, "social effects" (p. 29). According to Rogers, social effects on the structure of the system may either impede or facilitate the rate of diffusion, i.e. the adoption of new ideas in that system.

Rogers acknowledged the alternate tenet: Diffusion of ideas may change the social structure of a system (p. 30). Through his discourse, one begins to understand the dynamic interaction of the social system on the individuals and of the individuals on the

social system. This interaction develops the "norms," i.e. the behavior patterns established and tolerated as a guide or standard for the members of the social system (pp. 30-31). As a descriptor for "norms," Rogers used the word, "standard," the term used by Lewin. The association of these terms may also be made with the components of "culture" within the organization, as explained by Schein and cited above.

Rogers described two types of social change: *immanent change*—occurring within the social system when members innovate and diffuse an idea without external influence; and *contact change*—occurring when external sources introduce the innovation (pp. 8-9). This latter phenomenon is further parceled into *selective contact change*—a resultant change selected by members of a social system based upon their needs, and *directed contact change* or *planned change* (p. 9). According to Rogers, planned change is the type of social change that is initiated by outsiders, who, acting "on their own or as representatives of change agencies, intentionally seek to introduce new ideas in order to achieve goals they have defined" (p. 9). Rogers' definition of planned change parallels Lippitt's model, which stressed the involvement of the change agent. Both models accentuate the opinion that the change agent in "planned change" originates from an external source, not from within the social system.

Havelock's Theory of Change.

Havelock's (1995) definition of planned change differs from Rogers' and Lippitt's in that it includes "deliberate action of persons from inside or outside the system (or both)" (p. 48). A change agent from outside the system may be perceived as a threat, someone who is inferior, someone from a different culture, or someone who will not

understand, therefore not respond appropriately (p. 56). Not withstanding others, this may contribute to the development of defensive routines in response to embarrassment or threat as pointed out by Argyris (1999, pp. xiii-xiv). For these reasons Havelock noted that theorists have put effort into methods of communication and relationship development between the change agent and the clients. Havelock's book, *The Change Agent's Guide* (1995), demonstrates a working model, presenting procedural advice for the change agent. In agreement other theorists, this user-friendly model encourages involvement through action.

Based on Lewin's three-step model, Havelock expanded the second step, the "moving" step, into his stages 2, 3, 4, and 5. The model is outlined below with comparative remarks in parentheses as the stages relate to previous models discussed.

Stage 0: *Care*—This is the arousal stage at which the realization that a need for change exists. (*Unfreezing*-Lewin; *Phase 1*-Lippitt; *Knowledge Stage*-Rogers)

Stage 1: *Relate*—The change agent concentrates on communicating and building relationships with clients and among them within the system. (*Phase 2*-Lippitt; *Persuasion Stage*-Rogers)

Stage 2: *Examine*—The change agent diagnoses or defines the problem. (*Moving*-Lewin; *Phase 3*-Lippitt)

Stage 3: *Acquire*—This is the search for and location of resources. (*Phase 4*-Lippitt)

Stage 4: *Try*—The best solution is tested. (*Phase 5*-Lippitt; *Decision Stage*-Rogers)

Stage 5: *Extend*—The change is diffused throughout the system. (*Phase 5*-Lippitt; *Implementation Stage*-Rogers)

Stage 6: *Renew*—The system stabilizes. There is an effort to build a capacity for the system to continue to "re-C-R-E-A-T-E" (Havelock, 1995). (*Refreezing*-Lewin; *Phase 6*-Lippitt; *Confirmation Stage*-Rogers).

The acronym, "CREATE" identifies the first letters of the stages with an added "R" for "Renew" as Havelock's reminder to recreate the process (p. 11). Havelock emphasized that his Stage 6 is the same as Lewin's Refreezing (p. 49). Havelock developed each stage with detailed suggestions for addressing specific issues. Havelock highlighted the active role of the change agent throughout the process. Additionally, he stressed the importance of client involvement in the process of change. He suggested collaboration when diagnosing problems (p.86).

Summary of Review on Change Theory

Several theorists have added their contribution to the stages of change as they have worked through the process. Within the text of his work, Rogers (1995) repeatedly called for more research to support the theoretical base of diffusion of innovations. Each new example adds credence to the work already done. More important, changes in systems can be managed better by understanding previous research and theoretical bases. Rogers pointed out that the reason for failure in change is that the problem is not correctly analyzed. He said that we must start with the problem analysis, not the solution. We must be careful that our bias and beliefs do not taint the analysis. Data should be used for accuracy in analysis.

In summary, several principles of change may be delineated from the review of these models. These principles were used in the formulation of the learning organization for this study:

- There are three basic steps to the change process: Unfreezing, Moving, and Freezing at the new level (Lewin, 1947). Other models have added processes to these basic steps to incorporate the importance of building relationships between the change agent and the social system and among the members of the social system, communicating, and working on the action plan (Lippitt, Rogers, Havelock).
- The group has an effect on the freezing (refreezing) process. An individual is more likely to make a choice or a decision on the basis of his/her membership in a group rather than on personal preference. If the valued standard of the group is changed, it facilitates change in the individual (Lewin, pp. 228-231).
- Involving stakeholders in the diagnoses of problems and problem analyses not only emphasizes shared responsibility, but also causes the members to seek solutions and to invest in the change process. A caveat is the preservation of ego identity.
- Motivation is not enough to initiate a lasting change. *Motivation* and *action* must be linked in order for change to take place (Lewin, Lippitt, Rogers).
- One should not rule out having someone within the system as the change agent (Havelock).
- Data must be collected to accurately analyze the effect of the change (Rogers).

Review of the Application of Change Theory in the Healthcare Field

Overview

Within the healthcare field, much of the literature about change addressed it as an unwelcome, chaotic event. A few articles listed characteristics with symptoms to describe the various phases in the change process through which one would travel (Browne & Smith-Sharpe, 1995; Neuhauser, 1997; Perlman & Takacs, 1990). Other articles gave proactive approaches. These positive approaches integrated change as a factor in a learning organization (Ball, Counts, Helfrich Jones, Vinci, & Winn, 1998; Helfrich Jones, Counts, Vinci, Winn, & Ball, 1998; Garcia, 1996). A learning organization "provides for adaptive learning, allowing it to expand and evolve, thus influencing its future." (Ball et al., 1998, p. 29).

Phases of Change

Perlman and Takacs (1990) stated that organizations must deal with the human emotions associated with change or else they risk not being able to fulfill their goals. They stressed that the psychological impact of grief associated with change is not unlike that of the grief dealing with death according to the model of Elizabeth Kuebler-Ross (1969) as presented in her famed book, *On Death and Dying.* They added five phases to Kuebler-Ross's original five. The joined phases include: equilibrium, denial, anger, bargaining, chaos, depression, resignation, openness, readiness, and re-emergence. Perlman and Takacs listed characteristics and symptoms for each phase. The interventions are the capstone of this article. These included the following communication skills, which are parceled out to address each phase: active listening,

reflective listening, assertiveness, problem-solving, conflict management, win-win negotiations, reflection, search for identity and meaning, information-sharing, encouragement of open expression, direction, provision of guidelines, answering questions, and redefinition of roles (Perlman & Takacs, p. 34).

In an article addressing change in the adoption of developmentally supportive and family-centered care within NICUs, Browne and Smith-Sharpe (1995) delineated six stages of development. Progress through each stage seems to be dependent upon support or disruption from both internal and external factors. The stages are:

1. *Awareness*: This is the exposure to the concepts. It is usually met with excitement and interest. However, staff may become overwhelmed with the amount of information and the lack of implementation plans.
2. *Disruption*: Staff resistance or apathy toward the changes may manifest in unwillingness to change techniques.
3. *Organization*: Meetings and consultations with outside sources are organized. Resources and information are gathered. Plans are made for education and policy change.
4. *Identity*: Protocols and procedures are developed and implemented. Staff is accepting, however it may not have a complete grasp of the rationale or of the procedures to individualize developmentally supportive and family-centered care.
5. *Integration*: Developmentally supportive care is becoming more sophisticated and individualized. Staff becomes aware of its need to enhance and expand areas of care, however, it needs assistance. Staff members need to transition

their belief that they can accomplish goals by themselves to the belief that infants are collaborators in their own care.

6. *Generation*: The NICU is able to integrate developmentally supportive and family-centered care into its philosophy and practice, from individualized care to evaluation. Staff is flexible and able to generate new approaches.

Neuhauser (1997) explained the process of change as a "journey through hell" (p. 5). Her observation is that after the change process is started, there is a dip in the middle where there is chaos and everything looks like a failure. The following are her suggestions to help staff:

- Warn them to plan to speed through the chaos stage.
- "Provide training *quickly* to help people reduce their feelings of incompetence and confusion."
- "Give people a safe and professionally appropriate way to grieve the loss of the old ways."
- "Stick together." (pp. 6-7).

Neuhauser encouraged the development of relationships throughout the process of change. She stressed the importance of trustworthy behavior, beginning with self. These suggestions are positive approaches that should be encouraged.

Proactive Approaches to Change

As suggested by Neuhauser, Trofino (1997) also recommended speed and flexibility within the healthcare organization to reduce the resistance to change as

described in Lewin's model. She suggested the use of teams to "cope with chaos" and to encourage the flow of ideas (p. 50). Additionally, she acknowledged the value of information sharing, nurturing innovation, and remaining open-minded. Trofino stated that success in the organization is in its ability to "accept turbulence and change as permanent" (p. 50). She encouraged the organization to take advantage of the turbulence because at that time, resistance to change is lowered and a window of opportunity is created. She suggested the following principles (pp. 67-69):

1. Stay well-informed.
2. Get a firm grip on values.
3. Embrace (or at least accommodate) new technology.
4. Master change management.

Trofino's positive approach described several elements of a learning organization. Having an active learning organization is advantageous because the members have similar values in their shared vision and systems thinking (p. 50). Using these analyses of progression through the change process, a change agent has a blueprint by which to help the organization.

Literature Review on Social Learning Theory, Adult Learning Theory, and Organizational Learning

Social Learning Theory

Bandura (1977) emphasized that there is a continuous, dynamic, reciprocal interaction of three factors in human psychological functioning: (a) personal factors, (b) the environment, and (c) behavior (p.194). As each of these components is addressed, one should be mindful of their interdependence.

The environment of the NICU is critical because the individual space of the infant is the difference between life and death of the infant, as well as the difference between life and the quality of life in the present and the future. Bandura's theory supports the fact that the caregiver should pay particular attention to the behavioral cues of the infant as his/her way of communicating his/her personal contention or satisfaction with the environment and the caregiving. The adjustments made in response to the infant's cues will optimize the infant's personal factors and thus conserve energy for the task of survival, growth, and development. "Infant cues" are an important aspect of DSC.

Likewise, overall environment in the NICU affects the quality of care demonstrated through behavior of the parents, who may or may not want to spend critical bonding time in a depressing environment. Additionally, it affects the quality of care demonstrated by the behavior of the staff, whose human needs and personal factors in a supportive or non-supportive environment may influence its level of caregiving. If adjustment of environment and caregiving can be influenced by knowledge of the optimal course of action, i.e. best practice, then the infant will benefit developmentally. Parents and staff will benefit personally knowing that they are providing the best care for the infant. Thus,

environment critically affects the behavior of infant and the caregivers (both parents and staff), personally and behaviorally. Environment is an important aspect of DSC. Bandura's Social Learning Theory supports this premise.

Andragogy

In order to teach nurse clinical nurse leaders, it is not enough to develop goals of the program within the context of organizational needs. One must also consider the needs of the clinical nurse leaders and of the staff as adult learners. In Nielson's qualitative research study (1992) designed to test the concept of andragogy in the continuing education of oncology nurses, the nurses reported, "the most valuable outcome of the program was the change that occurred within them as individuals" (p. 151). This was stated as the *most valuable* outcome rather than the acquisition of skills and knowledge, which was the expected outcome. Nielson critically reviewed the definitions of and approaches to andragogy of several field practitioners. She concluded that the most encompassing view that addressed the needs of nurses in oncology was that of the Nottingham Andragogy Group. This group's global view defined andragogy as the process of adults' awareness of their acceptance without criticism of the assumptions by which they lived their lives. This heightened awareness gave them the ability to be critical of these assumptions. In the Nielson study, the educational process designed to meet the needs of the adults in this way caused a transformation in the learner.

Similar to the oncology nurses, the staff in the NICU faces many serious and sometimes dire situations in the workplace. Applicable to the NICU staff, Nielson stated that remaining empathetic under these conditions "necessitates an educational process

that assists nurses to engage in self-reflective learning." (p. 151). She pointed out the importance of principles and practices offered by Malcolm Knowles, one of the principal developers and proponents of andragogy. Although Nielson used Knowles' principles and practice implications to develop her particular study, she emphasized that the stretch must be made beyond instrumental or behavioral aspects of task-oriented learning to dialogic and self-reflective learning as reviewed by Mezirow (1990). Dialogue and self-reflection ask the "why" of learning. Beliefs, values, and practices are questioned and analyzed and the heightened awareness helps the learner to establish a clearer understanding and view. This type of learning encompasses varying interpretations of social and political aspects as well as relationships. Nielson concluded that this distinguishes education from training (p. 151).

Andragogy has been contrasted with pedagogy, the traditional and dominant model of education geared toward the instruction of children. However, in his later writings, Malcolm Knowles (1984) explained andragogy as "a system of concepts," rather than a theory, which "incorporates pedagogy rather than opposing it" (Knowles & Associates, pp. 7-8). Therefore, it is appropriate to use the pedagogical approach for adults when new material is presented.

According to Knowles, the pedagogical approach assumes that the learner is submissively dependent on the teacher regarding what, how, when and whether learning has taken place. The experiences of the teacher, the material, and the resources are transmitted to the learner at a time when he/she is deemed "ready." Curriculum is sequenced and motivation is extrinsic (pp.8-9). Teaching method is content-oriented. Knowles reported that the "ideological pedagogue" is one who may erroneously hold on

to the dependency of the learner and teach to the pedagogical model (Knowles, 1980, p. 43). As Knowles acquiesced, the pedagogical approach is appropriate in the event of presentation of new concepts.

Knowles contrasted the andragogical model in the assumptions that the learner is self-directing and responsible for self. He/she participates in his/her own learning. Experience cannot be discounted. This makes the learner a resource unto self, to the teacher and to others in his/her group. Readiness is determined by developmental need or it is induced by role models and experiences that challenge the learner to assess his/her work and plan for change. Curriculum is arranged around "life situations" or work needs rather than subject matter. Motivation is intrinsic although pay raise and promotion may be extrinsic forces. The resultant teaching method is a process design with the teacher as facilitator. The assumption is that the teacher facilitates both the process of learning and the acquisition of resources and content. Knowles laid out seven elements that make up the andragogical process design (pp. 14-18):

1. *Climate setting,* including physical environment and psychological climate (mutual respect, collaborativeness, mutual trust, supportiveness, openness and authenticity, pleasure, and humanness).
2. *Involving learners in mutual planning.*
3. *Involving participants in diagnosing their own needs for learning* (meshing "felt needs" with organizational "ascribed needs").
4. *Involving learners in formulating their learning objectives.*
5. *Involving learners in designing learning plans.*
6. *Helping learners carry out their learning plans* (use of contracts).

7. *Involving learners in evaluating their learning.*

It has become evident that students at any age are capable of self-directed learning, an andragogical approach. It is the skill of the teacher as facilitator to determine the individual needs of the student and to address each with the appropriate approach. The emphasis is on the participation of the learner in his/her own education.

Action for Change

Eduard C. Lindeman (1926) was influential in forming many of the operative foundations in the fields of civil liberties, social work, and adult education. In the 1920's, he addressed social policy through encouragement of participation in education. A university teacher of sociology and philosophy, Lindeman's idealism underpinned a pragmatic approach. His action was inseparable from his teachings. His intolerance for injustice led him to front-line action in campaigns for civil liberties. He espoused that progress is not realized by "thinking, wishing or by chance" (Kidd, 1961, p. xxi). The learning and application of factual material is dynamic and must be put into action in order to realize change and growth. He believed that adult education includes *action* for change.

Although Lindeman's writings were not appreciated for several decades, his contributions are now considered classic to the importance of the use of small groups in leadership and organizations. Lindeman felt that an educated group could operate democratically while using its knowledge and power as a group. His beliefs and philosophy in adult education are very similar and possibly foundational to many of today's writers of organizational learning and of leadership in organizations. His

philosophy of the "good man" is one that may be encouraged in leaders of groups within organizations. Excerpts of a 1951 address entitled, *Education and the Good Life*, were delineated in the editor's preface of the reprinting of Lindeman's book, *The Meaning of Adult Education* (1926). In his address, Lindeman listed descriptors of the good man. These included specific vices that a good man avoids: the goal of perfectionism, extremism, blaming, persecuting, hating, using self or others as a "means to external ends," and treating others as inferior. Lindeman espoused positive actions for the good man: using conflict to move self to higher levels, participating in groups without losing self-identity to the group, not abandoning the "right to dissent," using humor, believing and acting as if life is an exciting adventure (Kidd, 1961, p. xxii).

The positive qualities enumerated by Lindeman are those that would benefit an agent of change as he/she undertakes action within an organization. Likewise, the change agent would be wise to be mindful to avoid the vices that were pointed out. As the area of organizational learning is discussed below, Lindeman's named characteristics of the good man should be kept in mind and interwoven with the suggestions by other leaders in the field.

With the approach of the change agent as being a flexible facilitator, the learner is more apt to understand his/her value in the process of learning and of his/her own ability to change. Nielson (1992) questioned if this self-recognition, rather than the learning of rote skills, should be the goal of the educational process in continuing education programs for nurses. She suggested that this approach would align learners closer to the goal of andragogy, "which is to assist learners to function as self-directed learners" (p. 151). The focus of the facilitator, or change agent, would be on the learner rather than on

the skills. This would encourage the development and investment in "educational endeavors," a term used by Nielson, or, as termed by leaders in organizational development, a "learning organization."

Reflection in Learning

The writings of Jack Mezirow and associates (1990) are in agreement with Nielson's focus on the adult learner in effecting a change or transformation in the field. In a compilation of works depicting different areas of expertise, Mezirow and associates presented various methods of influencing adults to critically reflect on their areas of practice to determine the meaning behind their actions in the field. The educator is actually a co-learner who facilitates the learners in the exploration of their own experiences and in alternate ways of interpreting those experiences through reflection. Reflection is the process by which the learners are able "to correct distortions in (their) beliefs and errors in problem solving" (p. 1). Mezirow encouraged critical reflection as a means to critique the "presuppositions on which…beliefs have been built" (p. 1). Mezirow contended that learning, which is based on one's interpretation of his/her experiences, is "powerfully influenced" by assumptions. These assumptions are "habits of expectation," which form schemes and perspectives that structure meaning. According to Mezirow, reflection can mediate the process of interpreting meaning from experience influenced by one's habits of expectation (p. 4). The learner has the ability to reflect on prior learning and to consider the present circumstance in light of that prior knowledge and experience. Mezirow pointed out that learning theorists have ignored the consideration of the learner's ability to choose whether or not the prior learning

experience is justified under present conditions. This factor is critical in the consideration of individualized developmental care in the NICU. The correct procedure for one premature infant must be reflected upon before using it for another infant under different circumstances. This is an example of *reflective action*, as Mezirow differentiated from *thoughtful action*, which simply draws on one's knowledge or skill base. On a continuum, reflective action is "predicated on a critical assessment of assumptions" (p. 6). It is an extension of thoughtful action, which may be tainted by prejudices and distortions.

In the NICU, each infant presents its own challenge, medically as well as socially and developmentally. Each infant offers its own cues that can be interpreted and assessed by the observant caregiver and shared with the parents, or vice versa. The sharing of critical information, developed through reflective interpretation of one's experience, is the essence of the "reflective practitioner." In his classic writing, *The Reflective Practitioner* (1983), Donald Schön addressed the value of expertise in the professionals' repertoire. His vision of social progress and well being for the client or patient through empowerment is congruent with the practice of family-centered care.

Building a Model for Adult Learners

Using the principles of adult learning and program planning as a foundation, Patricia A. Lawler and Kathleen P. King (2000) developed a conceptual model, *The Adult Learning Model for Faculty Development*. As gleaned from a literature review of adult learning, they delineated six adult learning principles as a base for their program (pp. 21-24).

Similar in their matching, both the Knowles and the Lawler and King sets of principles include learning for action, which leads to change. The models can be modified to include reflection, modeling, and dialogue. These processes would add more specific ways to formulate an action plan, to carry it out, and to review and evaluate it. Table 1 is a side-by-side comparison of Lawler-King with Knowles' seven-step, Andragogical Process Design Model.

Table 1

A Comparison of Two Adult Learning Models

The Adult Learning Model for Faculty Development (Lawler & King, 2000)	***Andragogical Process Design Model*** (Knowles, 1980)
Create a climate of respect.	Climate setting includes physical environment and psychological climate (mutual respect, collaborativeness, mutual trust, supportiveness, openness and authenticity, pleasure, and humanness).
Encourage active participation.	Involve learners in mutual planning.
Build on experience.	Involve participants in diagnosing their own needs for learning (meshing "felt needs" with organizational "ascribed needs").
Employ collaborate inquiry.	Involve learners in formulating their learning objectives. Involve learners in designing learning plans.
Learn for action.	Help learners carry out their learning plans (use of contracts).
Empower participants.	Involve learners in evaluating their learning.

Extension of Change and Adult Learning into a Learning Organization

Peter Senge developed a process of disciplining the learning of members of an organization. In his classic book, *The Fifth Discipline* (1994, rev. ed.), he described how to lay the "cornerstone" of systems thinking, that is, to be able to see the whole "'structures' that underlie complex situations" (p. 69). According to Senge, *systems thinking* is the "fifth discipline," which provides the base for organizational learning. Its premise is to help the members shift from being "helpless reactors" to situations to realizing that they are "active participants in shaping their reality" (p. 69).

In addition to systems thinking, Senge defined four other disciplines. *Personal mastery* is "the discipline of continually clarifying and deepening our personal vision, of focusing our energies, of developing patience, and of seeing reality objectively" (p. 7). *Mental models* "are deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action" (p. 8). According to Senge we are often unaware of our mental models and their effects.

Shared vision is "the capacity to hold a shared picture of the future we seek to create…goals, values, and missions that become deeply shared throughout the organization" (p. 9). *Team learning* is described as a phenomenon in which "the intelligence of the team exceeds the intelligence of the individuals in the team" (p. 10). Senge emphasized that "dialogue" is the medium by which the team is able to "suspend assumptions and enter into a genuine 'thinking together'" (p. 10). He distinguished the art of dialogue from the more competitive communication that is enacted in "discussion" (p. 10).

These tenets provide a practical basis for forming a learning organization. A facilitator guides the members into exploring the areas of study and determining how the organization will move forward in the process. It is the membership that selects the direction of the learning. Senge, Kleiner, Roberts, Ross, and Smith (1994) have written a field book, which presents vignettes and resources of leaders who facilitated learning organizations in various professions. The vignettes model theory in action.

Literature Review on Developmentally Supportive Care in the NICU

The Evolution of Developmentally Supportive Care

Specialized care for the preterm infant was documented in France in 1893 under Dr. Pierre Boudin. He espoused minimal handling of the infant as well as infection control. His research reported a decrease in infant mortality leading to the adoption of these principles by the United States (DeLestard & Lennox, 1995).

According to a summary by DeLestard and Lennox, the following timeline portrays the incidents that led to the development of the philosophy of developmental care:

- 1959—research study by C. Drillien determined that there was a high incidence of handicapping conditions among preterm survivors
- 1960s—nursery modifications included round-the-clock handling of preterm infants
- 1970s—development of monitoring equipment and ventilatory support; Regionalization of health care facilities caused mothers with preterm infants to be

transported, often to a distance away from family support. Life saving was increased, however, so was the detriment of isolation.

- 1980s—researchers recognized that separation of mother and infant, as well as overstimulation caused by the NICU environment, contributed to abnormal developmental outcomes for many infants.
- 1990s—integration of basic care principles, advancements in technology, and individual care of the infant was recognized.

Prior to the 1980s, the care of premature infants evolved under differing standards, a lack of theory, and no general agreement on intervention procedures. Unresolved ethical dilemmas over caregiving and termination of care, neurological concerns, and the use of various intervention techniques were the major issues highlighted by studies at that time.

The *Neonatal Behavioral Assessment Scale* (NBAS, 1995) was initially published in 1973 by Dr. T. Berry Brazelton, M.D. and colleagues at the Harvard Medical School and the Child Development Unit, The Children's Hospital Medical Center, Boston. The NBAS is a behavioral scale on which is recorded the interaction and self-regulation ability of the full term newborn as he/she engages with the environment. Developed over a twenty-year period, this instrument is used to observe the efforts of the full term infant as he/she tries to exercise some control over the environment. With the observations of the differences of coping with environmental stimuli and caregiver handling among full term infants, the question naturally arose about the differences in ability to self-regulate between a full term versus a preterm infant. Thus, the NBAS was modified to assess

preterm infants' abilities to regulate and integrate their behaviors. This tool, the *Assessment of Preterm Infants' Behavior* (APIB), is used to observe the preterm infants' adaptive strategies to the stimuli presented by the examiner.

In a pilot study, Heidelise Als, Ph.D., Director of Clinical Research at Boston Children's Hospital Medical Center, and colleagues, compared a small group of term infants (n = 10) with preterm infants (n = 10) at the same post-conceptual age. Although some of the preterm infants' individual capacities were comparable to the term infants, their abilities to organize behaviors were different than that of the term infants. It was noted that the preterm infants were "more sensitive to environmental inputs, more easily stressed and overstimulated, and more likely to overreact" (Als, 1981, p. 27). This pilot study fueled further inquiries into the ability of preterm infants to communicate to caregivers through cues, i.e. communicate their reactions to environmental stimuli. Within this early article, Als addressed the encouragement of parents and caregivers to sharpen their observation skills so that they could become sensitive to recognizing the individual infant's issues and needs through the cues.

The Synactive Theory of Development

"This dynamic, continuous interplay of various subsystems within" the infant is the Synactive Theory of Development postulated by Als (1982). The subsystems include: autonomic, motor, state-organizational, attention and interaction, and regulatory. These subsystems can be assessed to determine the infant's intrinsic motivation and ability to adapt or cope with disturbances or disorganizations in environment.

Als postulated that care should be individualized according to the infant's cues; that even frail infants are capable of showing positive or negative responses through motor behavior, postural tone, facial expression, and alterations in behavioral state, as well as through autonomic and visceral responses (Als, 1982). This formed the base of other areas of DSC.

The 1990s presented several opportunities for growth in honing staff skills to provide individualized DSC and to look at the opportunities to involve families in the care of their preterm and sick babies. Family-centered care became more than a buzzword in the NICU. It is now considered an ethical standard of practice and NICUs are looking at ways to incorporate it in their standard of care.

CHAPTER III

METHODOLOGY

Introduction

This study used an action research paradigm derived from the review of literature in the theories of change, social learning, adult learning, and organizational learning. A learning organization was facilitated to increase the level of developmentally supportive care interventions in the NICU by staff members. This approach is identified as action research because the objective was to bring about an immediate change in practice through reflection, dialogue, and modeling. As conceptualized by Kurt Lewin, action research is "a method of interacting with or participating in a system for the dual purposes of learning about the system and effecting a change in the system" (Streubert & Rinaldi Carpenter, 1995, p. 255).

Participants

Clinical Nurse Leaders

The senior clinical nurse leaders in the NICU of Magee-Womens Hospital, nine fulltime middle management supervisors, were the participants of the learning organization by convenience. All were females. These supervisors were involved in the day-to-day working of the NICU and its staff and form a very stable core in the NICU. Based on Lewin's seminal model of change (1947), it was likely that this group might make the commitment to change based on their membership in the group rather than on personal preference.

It must be noted that the material that the nurse leaders were given and the techniques that they were encouraged to promote were not new procedures. Participants

were previously trained in DSC through in-services and conferences supported by the NICU Nursing Management. They earned educational credits for their participation in this learning organization, just as they had received educational credits in former endeavors.

An introductory letter requesting their participation in the study was given to each clinical nurse leader (Appendix A). Included with the letter was a brief questionnaire requesting demographic information. Demographic characteristics of the nine nurse leaders revealed an average of 25 years of nursing practice (range: 17-32 years) with an average of 23 years NICU experience (range: 13-32 years). They averaged 7 years in nursing supervision, with a range of 0-20 years. NICU supervision averaged 6.8 years, ranging 0-20 years. There were 4 nurses who had less than 5 years of supervising experience. Four of the registered nurse clinical nurse leaders have a Bachelor of Science in Nursing, three have nursing diplomas, and two have Associate Degrees in Nursing.

Staff

The NICU has a nursing staff of approximately 150 personnel, 15 Cardiopulmonary Technicians, and several other ancillary staff. The staff was trained in DSC through in-services and conferences supported by NICU management. There were no identifying names of nurses or staff providing care collected on any observation forms.

Raters

Two infant developmental specialists, with Master in Education degrees in Early Intervention, and Bachelor of Science degrees in Child Development, were trained as raters to observe and rate DSC at the infant bed spaces. These specialists are infant/early childhood interventionists employed in local community programs for infants/children with special needs. Both raters are females. They were blind to the hypotheses of the

study. They were trained in the use of the *Checklist for Observing Developmentally Supportive Care in the NICU*. They believed that they were hired to trial the instrument in the NICU. They were unaware of the intervention, since they collected data at various time periods (due to reliability establishment as well as actual study data collection).

Facilitator

The Principal Investigator (PI) was the facilitator of the learning organization of clinical nurse leaders. Responsibilities included providing background knowledge of DSC, encouraging dialogue and discussion, facilitating the meetings, and following-up according to the nurses' needs. The PI was a participant observer and kept fieldnotes during the meetings. Additionally, the PI trained the raters and established the standard for the *Checklist for Observing Developmentally Supportive Care in the NICU.*

Unit of Measurement

The unit of measurement was the care provided at individual infant bed spaces. Observation data were collected by raters only at the bed spaces of infants whose parents signed the Research Registry (Appendix A) as approved by the Institutional Review Boards of the UPMC Health System and Duquesne University. Green circle stickers marked the name cards on beds of infants who were Research Registry compliant. The stickers were placed by the Research Clinical Registered Nurse Practitioner in Newborn Medicine at Magee-Womens Hospital. The bed spaces that were marked as Research Registry compliant provided the convenience sample. There were no identifying names or medical numbers collected on any observation forms. Infants were not touched by the raters throughout the study. Bed spaces were not disturbed.

Materials

The following materials were used in this study:

- Copies of the *Checklist for Observing Developmentally Supportive Care in the NICU* (708 copies were used)
- Large brown envelopes in which the checklists were sealed and carried to and from the NICU
- Storage bag and closet in which the dosimeter and copies of the checklist were privately kept
- Radio Shack dosimeter (digital sound level meter, Cat. No. 33-2055), set at A-weighting, slow – used to measure the noise level at each bed space

The following materials were used during the Intervention (i.e. the meetings of the learning organization):

- A sign-in sheet for the clinical nurse leaders at each of the sessions. This was used to record in-service time so that they could receive education credit.
- Journals for each clinical nurse leader
- Agenda, Tenets and Research Findings, Worksheets, and References for the sessions (Appendix C)
- Motivational poster: *Think Outside the Bowl*
- Motivational video: *Gone Through Any Changes Lately?* (Browne & Edelman, 1998)

- Motivational materials: *Touch-It Color Change Paper*, thermochromic paper (Educational Innovations, Inc); poem, *Other Mother* (Kennedy & Pegher, 1995, pp. 10-11); miniature Slinkies, kaleidoscopes, and small incentives
- Snacks and fruit
- Summary PowerPoint Presentation: *Developmentally Supportive Care in the NICU: Preliminary Findings* (Zapalo, 2006, unpublished)

Instrumentation

The *Checklist for Observing Developmentally Supportive Care in the NICU* (Appendix B) was developed specifically for data collection for this study. There are 17 measurable developmental techniques that were selected from the research literature.

The checklist is organized into three conceptual areas: Environmental Support, Individualized Support, and Family-Centered Care. For each conceptual area, specific variables (criteria) of importance were identified. Dependent on the criterion, two to four levels of care are listed for each. The levels of care are arranged in ascending order, the last item as the most developmentally supportive (appropriate). The exception is the criterion, *Room Temperature*, which is arranged from lowest to highest selection of temperatures, the middle selection as the most developmentally supportive.

Validity

The validity of an instrument lies in its accuracy at measuring what it purports to measure. In this study, the domain covered was developmentally supportive/family-centered care (DSC) in the NICU. The instrument, *Checklist for Observing*

Developmentally Supportive Care in the NICU, was established on 17 research-based items, which are indicative of various criteria in developmental care and support. Each criterion was derived from two to six articles in the research literature (Appendix B). The average is three to four articles with supportive, clinically based evidence. Only one criterion, *Room Temperature*, was derived from a single article, however, the American Academy of Pediatrics (1999) published that article. It includes the Academy's recommended standards for the NICU.

Content validity was addressed by having experts in the field review the tool to determine if the material covered the domain of DSC. To establish content validity, this instrument was sent for peer review and expert opinions to eight clinically based practitioners. Feedback was received from the following six:

1. Victoria DeVito, MD, Neonatologist, Nashville, TN
2. Dena Hofkosh, MD, Developmental Pediatrician, Director, Child Development Clinic, Children's Hospital of Pittsburgh, at time of request
3. Roberta Smith, MD, Neonatologist, Director of Nurseries, Department of Neonatology, Memorial Health, University Medical Center, Savannah, GA
4. Linda Lutes, M.S., Infant Developmental Specialist, Consultant
5. Anna Marshall-Baker, M.S., NICU Environmentalist
6. Cheryl Milford, Ed.S., Neonatal Psychologist, NICU, Magee-Womens Hospital, Pittsburgh, PA.

Experts responded with positive feedback and with few suggestions for modification. Minor adjustments were made within the levels of criteria, however, it was agreed that the 17 criteria within the three conceptual areas should remain the same.

There was no existing instrument with which to compare or correlate the *Checklist for Observing Developmentally Supportive Care in the NICU*, therefore construct validity, concurrent validity, and criterion-related validity could not be established. Additionally, there were no relative existing scores to compare, thus, predictive validity was irrelevant.

The *Checklist for Observing Developmentally Supportive Care in the NICU* was a newly developed instrument created to measure levels of DSC in the NICU for this study. Content validity was established by (1) the authority of the literature review, and (2) the positive review of the experts in the neonatal field.

Reliability

Method.

Using the *Checklist for Observing Developmentally Supportive Care in the NICU,* reliability collections took place at three time points during this study. There were 76 rooms/infant care assessed by the Principal Investigator and two raters: (a) 31 after rater training and before any data collection, (b) 15 after the initial data collection, prior to intervention, and (c) 30 after rater re-training, prior to the post intervention data collection. Reliability collections generated a total of 228 sheets of observed data (76 rooms x 3 raters). Data collected for reliabilities were not used in the study data analyses.

The Principal Investigator's observations were the standard to which the two raters' observations were compared. During reliability collections, individual checklists were marked at each bed space by each rater and the PI within the same visit. After each observation we discussed our ratings of the 17 criteria. The purpose of the discussions

was to help the raters align their level selections to the PI and to the tenets of the observation instrument (the checklist—Appendix B).

Analysis methods for reliabilities.

Reliabilities were estimated with Cohen's Kappa (unweighted) and percent agreement with the PI. They were computed for each rater separately. The reliability assessments responses indicating, "not observed," were included in the analyses. For example, when feeding was not taking place during an observation, the raters indicated that it was "not observed." On the criteria, *Hand Position, Pacifier, Breastfeeding, Kangaroo Care,* and *Co-bedding,* raters checked the appropriate level if there were medical restrictions or familial considerations that precluded developmental techniques. Reliability assessments rated agreement between the PI and the raters' assessments.

Results and discussion for reliabilities.

In all instances the raters were compared to the PI. The majority of the kappas were in the range of ≥ 0.90-1.00 (see Table 2). All kappas are > 0.83 with the exception of *Communicative Voices* for both raters at 0.78 and *Containment and Positioning during Painful Procedures* for Rater 1 at 0.74.

Table 2

Kappas and Percent Agreement of each Rater to the Principal Investigator

Environmental Support	Rater 1 with PI		Rater 2 with PI	
Criterion	Kappa	% Agreement	Kappa	% Agreement
Diurnal Pattern	0.89	93%	0.91	95%
Shielding from Light	0.85	93%	0.88	91%
Noise Level	0.98	99%	0.96	97%
Communicative Voices	0.78	86%	0.78	86%
Room Temperature [a]	0.96	99%	0.96	99%
Range Across Criteria	0.78-0.98	86-99%	0.78-0.96	86-99%

(continued)

Table 2 (continued)

Kappas and Percent Agreement of each Rater to the Principal Investigator

Individualized Support	Rater 1 with PI		Rater 2 with PI	
Criterion	Kappa	% Agreement	Kappa	% Agreement
Cluster Care	0.94	99%	1.00	100%
Positioning	1.00	100%	0.96	97%
Baby Bendy	0.98	99%	0.92	95%
SnuggleUp[b]	0.89	99%	1.00	100%
Hand Position	0.94	96%	0.96	98%
Pacifier	0.92	93%	0.96	97%
Bili-lights[c]	1.00	100%	1.00	100%
Containment Feeding	0.83	95%	0.83	95%
Containment Pain	0.74	97%	0.85	99%
Range Across Criteria	0.74-1.00	93-100%	0.83-1.00	95-100%

(continued)

Table 2 (continued)

Kappas and Percent Agreement of each Rater to the Principal Investigator

Family-Centered Care	Rater 1 with PI		Rater 2 with PI	
Criterion	Kappa	% Agreement	Kappa	% Agreement
Breastfeeding	0.98	99%	0.95	97%
Kangaroo Care	0.86	92%	0.85	91%
Co-bedding	0.94	97%	0.94	97%
Range Across Criteria	0.86-0.98	92-99%	0.85-0.95	91-97%
Range for All Criteria	0.74-1.00	86-100%	0.78-1.00	86-100%

Note. PI = Principal Investigator.

[a]Initially, it was thought that the nurses could regulate the unit temperature, however, plant engineering controls the unit temperature.

[b]There were no SnuggleUps available to use for the majority of observations.

[c]There were very few infants that required bili-lights at the times of observations.

Based on the kappas it may be concluded that the *Checklist for Observing Developmentally Supportive Care in the NICU* has a high level of interrater reliability. Two criteria had lower kappas and these have reasonable explanations. For the criterion, *Communicative Voices,* the raters were more in agreement with each other than with the

PI (kappa = 0.78). When this difference was discussed, it was determined that the raters were more attuned to the sounds of distant voices, i.e. talking in the hallway, than the PI. For the criterion, *Containment and Positioning during Painful Procedures,* there was a discrepancy in agreement with the level selection by Rater 1 (kappa = 0.74). The disagreement with Rater 1 was in the grading of the level of support, rather than on whether or not there was developmental support.

Overall, the differences were relatively minor nuances suggesting that subjective interpretation of the observer does not interfere with the ratings. With understanding of DSC and with minimal training in the different levels on the checklist, patient caregivers in the NICU may reliably use *The Checklist for Observing Developmentally Supportive Care in the NICU*.

Methodology for the Intervention

The learning organization was the intervention. Members were unaware of the pre-intervention data collection and the checklist. The senior clinical nurse leaders ($N = 9$) participated in the learning organization with the PI as facilitator. The learning organization met from 09/12/05 through the week of 10/21/05, a six-week period. There were a total of six meetings (Appendix C) as well as a summary presentation of findings and suggestions of the learning organization.

The learning organization met on a weekly basis in a meeting room in the NICU. This was a familiar room where daily planning and breaks occur. This was a non-threatening, comfortable environment where snacks were made available and where the

nurses could be close to their patients in the event of necessity. The clinical nurse leaders signed in so that they could receive education credit within the hospital system.

Meetings were relaxed, but well paced to cover a maximal amount of information with time allotted for reflection, dialogue, discussion and responses. The PI completed literature reviews and selected segments prior to the meetings. In addition to facilitating, the PI was a participant observer. At the initial meeting, the clinical nurse leaders completed a form that rated the developmental areas in which they felt the NICU needed improvement (Appendix C). In subsequent meetings, the PI used their choices on this form to develop the research literature areas. The nurses examined the literature to explore the *why* of specific techniques of DSC. Rules for dialogue were established which encouraged expression without putdowns. Anonymity was assured.

Journaling was encouraged for offsite thought collection. Nurses did return with more thoughts concerning previous dialogue. Discussions occurred with other nurses outside the learning organization and ideas were shared at subsequent meetings. Problem-solving techniques were used. The nurses were asked to complete worksheets after each meeting (Appendix C). Most were motivated to complete the assignments directly after the sessions.

The learning organization members were encouraged to discuss action plans to promote the correct use of the technique by staff. The nurses had no qualms about sharing personal experiences and biases. The techniques that were reviewed and selected for development are the techniques that are delineated on the checklist:

Environmental Support
- Diurnal Pattern
- Shielding from Light

- Noise Level
- Communicative Voices
- Room Temperature

Individualized Support
- Cluster Care
- Positioning
- Use of Positioning Tools
- Hand Position
- Pacifier
- Shielding from Bili-lights
- Containment and Positioning during Feeding
- Containment and Positioning during Painful Procedure

Family-Centered Care
- Family as part of the Caregiving Team
- Breastfeeding
- Kangaroo Care
- Co-bedding Multiples

Not all criteria were thoroughly discussed. For example, nurses did not select to spend time discussing shielding from lights or from bili-lights. They felt that all of the staff shielded infants well. Additionally, they felt that it was unnecessary to discuss breastfeeding since there is a committee that handles this area and they felt it was always addressed. They did share their strong opinions regarding breastfeeding, Kangaroo Care, and co-bedding.

Findings were shared in a PowerPoint presentation on 11/10/05. All nine clinical nurse leaders and three members of the Nurse Manager Staff attended.

Methodology for Pre- Post Data Collection

Data collection for DSC took place at two time points during this study: pre-intervention and post intervention. There were 203 bed spaces/infant care assessed pre-intervention and 267 bed spaces/infant care assessed post intervention.

As discussed above, reliability and validity were established for the *Checklist for Observing Developmentally Supportive Care in the NICU*. The two raters used the checklist for observations and data collection pre- and post intervention. The PI did not collect data at these time points.

Pre-intervention data were collected between 04/25/05 and 06/16/05. Post intervention data collection occurred from 11/07/05 to 01/05/06. The raters collected data independently. Observation times were unannounced. They were at the discretion and convenience of each rater. Observation times ranged from 10:00 a.m. to 6:05 p.m. pre-intervention, and from 9:30 a.m. to 8:10 p.m. post intervention. Actual time for observation per bed space ranged from 5 minutes to 15 minutes dependent upon what was occurring. For example, observation of a bed space with a sleeping infant could take a minimal amount of time as contrasted with observation of a bed space where caregiving was actively occurring.

Procedure

Consultation with the neonatal psychologist at Magee-Womens Hospital and with peer practitioners, as well as a literature review of DSC and the change process, helped to delineate the research problem: A need was established to put research into the hands of the practitioners to help them understand why DSC is best practice for their patients. Since middle management nurses are frontline practitioners, their group was selected as the focus for change. The following is a summary of the procedures:

1. The Nurse Manager at Magee-Womens Hospital was consulted for preliminary approval. The study would complement the opening of the new Neonatal Intensive

Care Unit at Magee-Womens Hospital. Concern was underscored for patient care and for a stress-suppressed transition for staff. It was agreed that the clinical nurse leaders would receive in-service education credit.

2. A tool was needed to measure DSC. The Principal Investigator (PI) developed the *Checklist for Observing Developmentally Supportive Care in the NICU*. It was emailed to eight clinical practitioners in the neonatal field. There were six respondents. The checklist was fine-tuned by the PI.
3. IRB approval was obtained from two sources: Magee-Womens Hospital of the UPMC Health System and Duquesne University, educational institution of the PI.
4. Research Registry participants were identified. The PI and the neonatal psychologist completed a pilot study to trial the *Checklist for Observing Developmentally Supportive Care in the NICU* (Appendix B). A few minor adjustments were made to the checklist.
5. Using theoretical substance gleaned from literature reviews of change theory, adult learning theory, social learning theory, and learning organizational theory, the presentation and delivery of six learning modules were developed (Appendix C).
6. Two raters were hired and trained. Raters checked the boxes that described the specific levels of care for criteria observed at each bed space. A single checklist was used for each observed bed space. The raters recorded the date, time, and the number of infants observed in the Pod, and the Pod (A-E). This information was used for data entry, but not in analysis.

Data collection had the following inclusion criteria:

- Infants were medically stable.
- Parent signed the Research Registry.
- Rooms with infants being fed (not breast-fed) or actively being cared for by staff were seen first. This was to assure that significant sample sizes of these criteria were observed.
- Rooms with multiples were observed on a 100% ratio per visit.
- Since the unit of measurement was DSC, the same bed space with occupying infant could be observed several times throughout the course of the study.

7. Introductory letters to clinical nurse leaders and to nurses regarding the study were distributed and posted (Appendix A).
8. Research Registry participants were identified by the Research Clinical Registered Nurse Practitioner in Newborn Medicine, who placed green stickers on the name cards of beds in compliance.
9. Prior to pre-intervention data collection, reliability data were collected by raters (04/01/05 to 04/22/05). Reliability data were collected simultaneously with the PI and compared to her selections.
10. Pre-intervention observations were collected over a seven- to eight-week period, from 04/25/05 to 06/16/05. Randomization was the original intent, however, raters were able to collect data at each visit from all infant bed spaces that were Research Registry compliant.
11. Reliability data were again collected (06/16/05).

12. Clinical nurse leaders were called and time and place for meetings of the learning organization (the intervention) were established. Demographic information on clinical nurse leaders was collected at the introductory meeting (Appendix A).
13. The learning organization met from 09/12/05 through the week of 10/21/05, a six-week period. Learning organization contents of modules are in Appendix C. The PI kept fieldnotes of significant comments and suggestions during the meetings. Anonymity was assured.
14. Reliability data were collected (10/11/05 to 11/06/05).
15. Post intervention observations were collected over an eight- to nine-week period, from 11/07/05 to 01/05/06. Although randomization was originally intended, raters were able to collect data from all infant bed spaces that were Research Registry compliant.
16. An independent data entry specialist entered data. Data were entered in two sets: a reliability set and a study data set. Criteria were scored on a scale of 1 to 4, with 1 as the negative extreme and 4 as the positive extreme, or 2 as the positive extreme in criteria with dichotomous levels of care. When appropriate, a variable was marked as "not observed." This received coding that did not affect the outcome. Additionally, familial and medical considerations were checked and coded with no detrimental statistical outcome.
17. All data were analyzed using the program, Statistical Package for the Social Sciences (SPSS) Graduate Pack 13.0 for Windows. Reliability data were analyzed separately from study data.

18. Preliminary results/recommendations of the learning organization meetings were presented to the clinical nurse leaders and to the nurse managers in a PowerPoint presentation. Interventions were discussed.
19. Recommendations were made available to the NICU administration.

CHAPTER IV

RESULTS

Results of the Learning Organization Meetings

Introduction

Fieldnotes were taken by the PI during dialogue and discussions of the learning organization. Clinical nurse leaders were aware of the notes and were forthright in sharing information. They were assured that anonymity would be maintained. In every case when asked if their personal statements could be reported, they agreed. The information that they shared was honest, spontaneous, and based on experience. As a participant observer, the PI was welcomed and trusted.

Review of the Learning Organization on Environmental Support

Diurnal Pattern and Shielding from Light

Regarding the conceptual area, environmental support, clinical nurse leaders stated that the staff does well in the criterion, *Shielding from Light*. Therefore, little time was spent on this topic. A summary of the research literature was made available to them. Briefly, information about *Diurnal Pattern* was reviewed. They pointed out that family visitation, which is 24 hours per day, usually occurs in the daytime and early evening. At those times infants are more exposed to daytime lighting and activity, which helps them to adjust their circadian rhythm.

The PI suggested that the bed spaces with natural light from windows would provide the appropriate guide to adapting lighting patterns for individual infants.

Although the clinical nurse leaders agreed, they pointed out that these particular window bed spaces generally weren't well insulated resulting in colder areas in the winter and warmer areas in the summer.

Room Temperature

They discussed the lack of nursing control of room temperature. Plant engineering controls it and it is set according to hospital guidelines. The clinical nurse leaders said that it gets too cold in the nighttime, particularly in Pod E. They pointed out that this is where the majority of the windows are, referring to the discussion on diurnal pattern. They noted that at night some infants have difficulty maintaining body temperature. One clinician pointed out that she had observed an increase of bradycardic episodes during early morning hours in Pod E. It was mentioned that a window treatment would be appropriate.

Noise Level and Communicative Voices

The clinical nurse leaders were very interested in the noise level at bed spaces, in the hallways, and by the nurses' stations. Recommended level of sound by the American Academy of Pediatrics is < 59 dB, preferably < 45 dB. Studies have indicated that generally, NICU sounds average between 50 and 90 dB, with peak sounds as high as 120 dB (Holditch-Davis, Blackburn, & VandenBerg, 2003; Lotas, 1992; Thomas, 1995).

Two clinical nurse leaders requested and kept the dosimeter in their office so that they could measure the level of noise output by the nighttime equipment, in particular the riding floor polisher (70 dB). The NICU noise levels that they measured ranged from 58

dB for the ventilator to 70 dB for the suctioning off process of the ventilator. The red trash cans at every bed space and the desk monitors at the nurses' stations each measured 63 dB; bili-lights were 60 dB; alarms at bed spaces were 64-66 dB; IV pump alarms were at 61-64 dB. The laundry baskets at bedside closed at 64 dB. The clinical nurse leaders measured the noise from the NICU entry door in the hallway at 62 dB and a burst of laughter from the hallway also at 62 dB.

They were disturbed at the effects of the noise on the infants' development as reviewed in the literature: High intensity sound may damage cilia of the cochlea resulting in hearing loss, deplete energy reserve and disrupt sleep, and interact with ototoxic drugs increasing susceptibility to hearing loss (Warren, 2002). Other effects outlined in the literature include: increased infant fatigue, irregular sleep-wake states, increased heart rate, increased intracranial pressure, hypoxic episodes, and agitation (Holditch-Davis, Blackburn, & VandenBerg, 2003; Kenner & McGrath, Eds., 2004; and Lotas, 1992). At discharge, infants who have been on the oscillator are recommended to have a follow-up hearing screen at one year of age.

Results for Environmental Support by the Learning Organization

Protection of infants' ears and eyes.

- Do not use, or minimize use of, the floor polisher and buffer. In particular, never use them during the night, when infants are sleeping (establishing circadian rhythms and diurnal patterns).
- Fix the entry doors to the NICU to be less noisy when opened. Consider break-away doors or automatic doors.

- Purchase Mini-muffs for infants for protection during MRIs, oscillator use and other noisy procedures.
- Lower the tones of the monitors/vents/phone alarms.
- Look into softening the noise of the arrival and departure of the pneumatic tube. Several parents of infants in rooms A-2 and C-2 have complained.
- Do not round at bedsides: Use the technology, including CareVue, so that infants are less disturbed.
- Periodically use the dosimeter and post the results.
- Use attractive signage/computer desktop reminders to remind staff to keep it quiet at the nurses' stations.
- Write up offenders. Require a small fine to go toward DSC supplies and/or a personal visit from the neonatal psychologist or developmental specialist.
- Consider more absorbent floor and ceiling tile to cut down on noise levels.
- Purchase infant eye protectors that stay positioned correctly.

Temperature control.

- Have temperatures adjusted and monitored by nursing supervision.
- Monitor temperature in Pod E. Increase at midnight and reduce at 8 a.m.
- Purchase shades or window treatments for climate control at windows.

Review of the Learning Organization on Individualized Support

Cluster Care

Clinical nurse leaders acknowledged that in most cases the nurses are driven by completing the orders within the allotted time frame and not by observing the infant's cues. This is true for feeding as well. They reported that the recent addition of CareVue as the system of charting in the NICU has added the stress of completion of reports on procedures within a designated time frame with the threat of being reported by CareVue. Technology is not developmentally supportive for infants or nurses unless it is programmed to be so.

Positioning

Clinical nurse leaders at Magee-Womens Hospital have been in-serviced for several years on the importance of positioning the infant properly. They felt that they did this very well, but when asked to complete the mini-assessment attached to the Worksheet for that module, some of them realized that their own infants positioned prior to the meeting needed re-positioned. We discussed the need for vigilance in attending to this important function of DSC. There are experiences of a few children returning to follow-up clinic with shoulder retractions and other atypical postures and movements. The review of the literature explained why this occurs and how to prevent it through containment, nesting and positioning. We discussed the importance of sharing our knowledge with the families so that they would continue the proper positioning techniques when the infants are discharged home.

The clinical nurse leaders determined several areas that need to be addressed or that should be addressed more consistently:

- Positioning must be consistent and frequently monitored.
- Positioning tools are not always available. Nurses use rolled blankets and blanket wrappings to provide physiological support when tools are not available.
- Tools are not always used correctly. Nurses must assess the infant's size and needs before selecting the correct Baby Bendy or SnuggleUp.
- Infants move. They must be checked often for correct positioning.
- Infants need to be contained and positioned during feeding and painful procedures. Nurses need to pay attention to the infant's cues and offer support.
- Infant's hands must be positioned or made available midline for sucking and self-comforting unless there are medical concerns.
- Parents are not informed consistently about the importance of positioning. Staff should be offering and teaching this information.
- Some health providers and staff do not correctly position infants after exams.
- Pacifiers should be offered more often to develop sucking and for comforting. A medical decision should be available on the use of sucrose with pacifiers. Parents need to be better informed of the importance of pacifiers to preemies and sick infants.

Results for Individualized Support by the Learning Organization

- Supply positioning tools (SnuggleUps and Baby Bendys) for infants.
- Purchase positioning packets, Freddy the Frogs, bandanas for wrapping ELBW infants, gel pads, and covers for Freddy the Frog and gel pads.
- Purchase pacifiers that stay in and palate protectors for infants intubated.
- Neonatal psychologist or developmental specialist should continue to offer updates and in-services to staff on appropriate use of positioning tools. These specialists need to have scheduled hours of availability in the NICU for assistance to parents as well as to staff.
- Assign staff buddies to new staff members to help them with correct positioning techniques.
- Purchase and post positioning posters (Children's Medical Ventures, 2005) in every pod for staff and parents.
- Positioning information and pictures should be included in Discharge Packet or booklet for parents.

Review of the Learning Organization on Family-Centered Care

Breastfeeding

Breastfeeding was not an area that the clinical nurse leaders wanted to discuss. Initially, the PI assumed the reason for avoiding discussion was that several staff and volunteer members in the NICU including the Breastfeeding Committee, the Neonatal Nutritionist, Lactation Consultants, and La Leche League covered this topic. However, when the areas of Kangaroo Care and co-bedding were discussed, the nurses offered

personal preconceptions regarding all three family-centered techniques. One clinician did not share her thoughts, three were outspoken with negative comments, and the other five agreed with them, although with quiet reserve. The consensus for breastfeeding was that they would assist in teaching and helping a mom breastfeed her infant or pump the breast milk, however, they would not recommend it or encourage it. The PI referred to the research literature showing the benefits of breastfeeding. They agreed that the information was probably true, but since formula is added to fortify pumped breast milk, it is altered breast milk. Their concern was to feed the infant in the most efficient way to promote growth.

Kangaroo Care

One clinician stated, "Some moms really like Kangaroo Care." Kangaroo Care is skin-to-skin contact of parent with the infant. After two decades of use in industrialized and developing nations, benefits listed in the literature include: increased survival rates particularly in developing countries; improved lactation and ability to breastfeed; improved thermoregulation, heart rate, breathing, growth; reduced respiratory infections; better tolerance of feedings; reduced maternal stress; and increased maternal empowerment (Hedberg Nyqvist, 2004).

A mother of twins in the NICU informed the PI that she was participating in Kangaroo Care with her babies. She felt that it was helping her twins to stabilize and she was comforted knowing that she was contributing. When asked who taught her Kangaroo Care, she named one of the clinical nurse leaders.

The hospital protocol for Kangaroo Care in the NICU was reviewed in the learning organization meeting. Generally, the thoughts shared on Kangaroo Care within the learning organization were not supportive. In spite of the very positive literature review, the nurses listed the concerns they had with it. Once again the consensus was that they would demonstrate and monitor Kangaroo Care to parents only if asked. They do not actively promote it. One nurse stated that she had not seen Kangaroo Care since the move to the new unit.

Within the discussion and dialogue, it was interesting to note that some of the barriers listed in the literature were the same as the ones that the learning organization listed. In particular, safety aspects were the primary concern. Inconsistent attitudes among staff members and parental self-limited visitation were other barriers discussed.

The learning organization listed the following barriers to the consistent use of Kangaroo Care in the NICU:

- Safety issues – Because the new unit has single rooms in four of the pods, infants are too isolated. The opposing argument to this barrier is the available technology that warns staff of problems. Also, it was discussed that the contending argument against Kangaroo Care in the old unit was the lack of privacy, which is no longer an issue in the new unit with the individual rooms.
- Stability of infant – Nurses do not want to take the chance of a ventilated infant having difficulties during Kangaroo Care. We discussed that nurses are more comfortable promoting Kangaroo Care with larger healthier babies. However, the literature points to the stabilization of the very sick infant as the caveat of

Kangaroo Care. The protocol excludes not stable ventilated infants from Kangaroo Care.

- Staffing concerns – The clinical nurse leaders stated the need for dedicated time to observe and to supervise parents during Kangaroo Care, particularly when it is initiated. Time constraints preclude this. Nurses have two to three other patients at various levels of need in different rooms. They cannot give the uninterrupted time deemed necessary for Kangaroo Care.
- Comfort level of staff with Kangaroo Care – It was argued that nurses are vested in the care of their patients. The difficulty seems to be in the acknowledgement that their patients are members of families and that the nurses need to promote the parents' attachment to their infants.
- Inconsistent endorsement by medical staff – If the medical staff writes the permission, the nursing staff will follow through in providing Kangaroo Care.
- Low visitation rates by some parents – When caring for a patient, it is difficult to step aside for a parent who does not seem vested. Dialogue centered on being non-judgmental of families and acknowledging their primary role.

Co-bedding

Review of the literature supported findings that co-bedding twins or multiples promotes "physiological stability, co-regulation, growth, and development." (Byers, Yovaish, Lowman, & Francis, 2003, p. 341). Co-bedding infants at Magee-Womens Hospital has been promoted for several years. Medical staff encourages co-bedding when

infants are stable. Parents are pleased with it, stating that their infants seem more settled and less fussy when placed together.

The protocol was discussed. It clearly addresses safety and procedural issues. Although co-bedding is practiced, the nurses expressed concerns about safety issues, particularly with the infants' pulling at their siblings' tubes and monitoring wires. They were concerned about the spread of infection, although the literature supports otherwise. One clinician felt that there was an increase in bradycardia and desaturations, but there was no statistical foundation for this.

Concerns about staffing and the dedicated time needed to safely monitor co-bedding were discussed. Also, nurses said that co-bedded infants are separated one to two days prior to discharge (a) to determine their physiological stability and (b) because one may be discharged home before the other(s). Clinicians reported that most parents do not plan to co-bed when the infants are discharged home, therefore, they questioned the value of co-bedding.

These issues were discussed in light of the literature. The function of co-bedding is stability and transition to extrauterine life for the neonate. The nurses acknowledged that these functions were being addressed by co-bedding.

Results for Family-Centered Care by the Learning Organization

The clinical nurse leaders made the following recommendations in order to increase breastfeeding, Kangaroo Care, and co-bedding:

- Ancillary staff should continue to offer periodic in-services in breastfeeding, Kangaroo Care, and co-bedding to nurses and support them in the NICU.

- A specialist should be on staff in the unit during the day shift and some evenings and weekends to help the parents and staff directly with breastfeeding, Kangaroo Care and co-bedding.
- Larger beds should be provided for co-bedding multiples.

Of note, these recommendations relied on the support of additional staff. The clinicians did not provide an action plan for nurses.

Results of Data Collection

Introduction

The final phase of this study was data collection after the intervention. The raters collected data from 11/07/05 to 01/05/06, an eight- to nine-week period. As a point of emphasis, data collected for reliabilities were used only in the establishment of reliability, not in data analyses of the study of DSC.

Analysis Method of Pre- Post Data Collection

Ratings obtained for the level of each criterion on the checklist collected pre- and post intervention were compared using chi-square statistics. An alpha level of .05 was used for all statistics. Ratings that indicated *not observed* or not appropriate for the infant, due to familial or medical considerations, were excluded from these comparisons. Examples of the *not observed* ratings include selected levels such as, "Cluster care is not observed." The rater would have checked this level if she had observed a bed space in which the infant was sleeping and no active caregiving was occurring at the time. The rater would have observed and rated the lighting, shielding, positioning of the infant, use of positioning tools, hand position, use or position of pacifier, and she would have measured the noise level. She would have rated the family-centered care criteria as well.

Results and Discussion

Tables 3-5 show significant differences in some criteria in all three conceptual areas. Results of Table 3 show that the following criteria increased significantly in developmentally supportive care: *Diurnal Pattern*, *Shielding from Light*, *Noise Level*, and

Communicative Voices. The single exception in this conceptual area is the criterion, *Room Temperature*. Early in the study it was discovered that individual room temperature was controlled by plant engineering at the hospital, therefore, justifiably it could not be included in the results.

Table 3

Observed Levels of Developmentally Supportive Care for Each Checklist Criterion, Pre- and Post Intervention, Chi-Square Statistics

Environmentally Supportive Care

Checklist Criterion & Significant χ^2 for Pre/Post Comparisons		Number		Level of Developmentally Supportive Care: Least Supportive		2		3		Most Supportive	
		Observed	Not Relevant[a]	N	%	N	%	N	%	N	%
Diurnal Pattern	Pre-	104	99	48	46%	2	2%	0	0%	54	52%
$\chi^2(3) = 53.4$***	Post	253	14	63	24%	7	3%	92	36%	91	36%
Shielding from Light	Pre-	98	105	3	3%	29	30%	40	41%	26	27%
$\chi^2(3) = 20.0$***	Post	249	18	16	6%	26	10%	127	51%	80	32%
Noise Level	Pre-	99	104	0	0%	10	10%	47	48%	42	42%
$\chi^2(3) = 55.3$***	Post	243	24	0	0%	1	0.4%	47	19%	195	80%

(continued)

Table 3 (continued)

Checklist Criterion & Significant χ^2 for Pre/Post Comparisons		Number		Level of Developmentally Supportive Care: Least Supportive		2		3		Most Supportive	
		Observed	Not Relevant[a]	N	%	N	%	N	%	N	%
Communicative Voices $\chi^2(3) = 9.6$*	Pre-	99	104	2	2%	42	42%	14	14%	41	41%
	Post	246	21	7	3%	65	26%	32	13%	142	58%
Room Temperature $\chi^2(3) = 1.18$	Pre-	20	183	2	10%			18	90%	N/A	
	Post	11	256	0				11	100%	N/A	

[a]The raters did not observe these criteria or the criteria were not relevant. For example, during observations of infant feeding, neither *pacifier placement* nor *containment during painful procedure* were relevant

*p <.05, two tailed. ***p < .001, two tailed.

Only two criteria in Individualized Care, *Cluster Care* and *Hand Position*, had significant differences (Table 4), however, they were in the direction of less developmentally supportive care. Within the criterion, *Hand Position,* it must be noted that if there were a combination of *Level 3* (Hands are available to infant, but not supported midline) and *Level 4* (Hands are midline and available for sucking or infant is prone with hand by face), there would be an increase, although not significant, in the level of supportive care.

Table 4 illustrates that three of nine criteria increased in supportive care, though not significantly. These were *Containment and Positioning during Feeding*, *Containment and Positioning during Painful Procedure,* and *SnuggleUp.* Justifiably, *SnuggleUp* cannot be included because, due to lack of funding, this positioning tool was unavailable throughout most of the study. Also, the criterion, *Bili-lights*, had extremely low numbers. It was discussed and determined that by the time the Research Registry papers were signed by parents, their infants had completed any necessary treatment for hyperbilirubinemia, therefore, very few were observed receiving bili-light therapy.

Table 4

Observed Levels of Developmentally Supportive Care for Each Checklist Criterion, Pre- and Post Intervention, Chi-Square Statistics

Individualized Care

Checklist Criterion & Significant χ^2 for Pre/Post Comparisons		Number		Level of Developmentally Supportive Care: Least Supportive		2		3		Most Supportive	
		Observed	Not Relevant[a]	N	%	N	%	N	%	N	%
Cluster Care	Pre-	77	126	18	23%	15	19%	29	37%	15	19%
$\chi^2(3) = 8.6$*	Post	84	183	27	32%	25	30%	15	18%	17	20%
Positioning	Pre-	98	105	1	1%	9	9%	24	25%	64	65%
$\chi^2(3) = 2.60$	Post	249	18	9	4%	21	8%	72	29%	147	59%
Baby Bendy	Pre-	92	111	11	12%	1	1%	25	27%	55	60%
$\chi^2(3) = 0.60$	Post	196	71	25	13%	2	1%	61	31%	108	55%

(continued)

Table 4 (continued)

Checklist Criterion & Significant χ^2 for Pre/Post Comparisons		Number		Level of Developmentally Supportive Care: Least Supportive		2		3		Most Supportive	
		Observed	Not Relevant[a]	N	%	N	%	N	%	N	%
SnuggleUp	Pre-	96	107	96	100%	0		0		0	
$\chi^2(3) = 2.21$	Post	221	46	216	98%	0		1	0.5%	4	2%
Hand Position	Pre-	96	107	2	2%	11	12%	14	15%	69	72%
($\chi^2(3) = 23.2$***	Post	226	41	2	1%	15	7%	95	42%	114	50%
Pacifier	Pre-	72	131	0	0%	60	83%	5	7%	7	10%
$\chi^2(3) = 4.31$	Post	176	91	3	2%	153	86%	13	7%	7	4%
Bili-lights	Pre-	2	201	1	50%	1	50%				
$\chi^2(3) = 0.16$	Post	6	261	2	33%	4	67%				

(continued)

Table 4 (continued)

Checklist Criterion & Significant χ^2 for Pre/Post Comparisons		Number		Level of Developmentally Supportive Care: Least Supportive		2		3		Most Supportive	
		Observed	Not Relevant[a]	N	%	N	%	N	%	N	%
Containment and Positioning during Feeding $\chi^2(3) = 3.04$	Pre-	80	123	1	1%	9	11%	29	36%	41	51%
	Post	82	185	2	2%	9	11%	20	24%	51	62%
Containment and Positioning during Painful Procedure $\chi^2(3) = 4.30$	Pre-	32	171	8	25%	13	41%	6	19%	5	16%
	Post	32	235	5	16%	9	28%	6	19%	12	38%

[a]The raters did not observe these criteria or the criteria were not relevant, for example, during observations of infant feeding, neither *pacifier placement* nor *containment during painful procedure* was relevant.

*p <.05, two tailed. ***p < .001, two tailed.

Somewhat unexpectedly, there was a significant decrease in *Breastfeeding* (Table 5). There were also decreases in *Kangaroo Care* and in *Co-bedding* from pre- to post intervention observations. For *Co-bedding,* it must be noted that there were low numbers of multiples observed, only 10 pre- and 34 post intervention. Realizing that the numbers are at least in groups of 2, that would limit observed twins to 5 sets pre- and 17 sets post.

Table 5

Observed Levels of Developmentally Supportive Care for Each Checklist Criterion, Pre- and Post Intervention, Chi-Square Statistics

Family-Centered Care

		Number		Level of Developmentally Supportive Care			
		Observed	Not Relevant[a]	No	%	Yes	%
Breastfeeding	Pre-	120	83	44	37%	76	63%
$\chi^2(1) = 7.21$***	Post	232	35	120	52%	112	48%
Kangaroo Care	Pre-	81	122	33	41%	48	59%
$\chi^2(1) = 2.65$	Post	35	232	20	57%	15	43%
Co-bedding	Pre-	10	193	8	80%	2	20%
$\chi^2(1) = 0.08$	Post	34	233	28	82%	6	18%

[a]The raters did not observe these criteria or the criteria were not relevant. For example, if the infant was not a twin or multiple, then co-bedding was irrelevant.

***$p < .001$, two tailed.

Comparison of DSC in the Conceptual Areas

Three indices were generated from the comparison of criteria in the three conceptual areas: Environmental Support (4 criteria—excluding *Room Temperature* per discussion above), Individualized Support (8 criteria—excluding *Bili-lights* per discussion above) and Family-Centered Care (3 criteria). Mann-Whitney *U* statistics were used to compare values of these percentages pre- and post intervention.

Table 6 shows the indices that were based on the number of criteria rated at *Level 4*, i.e. the most developmentally appropriate care in the conceptual areas, Environmental Support and Individualized Support, and on the number of criteria rated at *Level 2*, i.e. the most developmentally appropriate care for Family-Centered Care.

Table 6

Comparison of Conceptual Areas Indices Pre- and Post Intervention

Conceptual Area	Time point	Number of observations	% of observations with optimal response			*U* values comparing pre- and post
			Mean	Median	Range	
Environmental Support[a]	Pre-	104	41.3%	25%	0-100%	2.92**
	Post	255	51.2%	50%	0-100%	
Individualized Support[b]	Pre-	179	39.8%	40%	0-100%	0.51
	Post	267	36.6%	40%	0-100%	
Family-Centered Care	Pre-	149	62.0%	100%	0-100%	-3.27***
	Post	232	45.9%	50%	0-100%	

[a]Due to low number of observations, the criterion Room Temperature was not included.

[b]Due to low number of observations, the criterion Bili-lights was not included.

**$p < .01$, two-tailed, ***$p < .001$, two tailed.

In order to account for the *not observed* ratings, the actual numbers of ratings were counted. Then the indices were weighted by 1/number observed. Indices then measured the percentage of observed items that were rated at the most developmentally supportive care (*4* or *2* where required).

The indices that measured percentage of observed criteria rated in the direction of the most developmentally appropriate care were significantly different in the conceptual area, Environmentally Supportive Care. Criteria rated significantly different in the direction of the least developmentally supportive were in Family-Centered Care.

CHAPTER V

DISCUSSION

Support for the Hypotheses

Research Hypothesis 1

Research Hypothesis 1: The *Checklist for Observing Developmentally Supportive Care in the NICU* is an instrument that reliably and validly will measure the level of use of specific developmental criteria in the NICU.

Content validity for the instrument developed by the PI was supported by the literature and by the positive responses and approval of the six expert practitioners (two neonatologists, one developmental pediatrician, one neonatal psychologist, one developmental specialist, and one environmentalist) in the neonatal field. According to Huck and Cormier (1996), “Subjective opinion from such experts establishes – or doesn’t establish – the content validity of the instrument, with no statistical procedures being applied to any data" (p. 89). In this particular study, content validity was established by (1) the authority of the literature review, and (2) the positive review of the expert practitioners ($n = 6$) in the neonatal field.

Interrater reliability was established through the comparison of the two trained raters to the Principal Investigator. Reliabilities were estimated with Cohen’s Kappa (unweighted) and percent agreement with the PI. They were computed with each rater separately. The majority of the kappas were in the range of ≥ 0.90-1.00, providing excellent support that the *Checklist for Observing Developmentally Supportive Care in the NICU* has a high level of interrater reliability.

Two criteria within the instrument had lower kappas. For the criterion, *Communicative Voices,* (kappa = 0.78)*,* it was determined that the raters were more attuned to the sounds of distant voices, i.e. talking in the hallway, than the PI. It was suggested that the PI should have her hearing evaluated. For the criterion, *Containment and Positioning during Painful Procedures* (kappa = 0.74), the disagreement between the PI and Rater 1 was in the grading of the level of support, rather than whether or not there actually was developmental support. These two discrepancies are considered minor in the overall evaluation of the reliability of the instrument.

It may be concluded that with understanding of DSC and with minimal training in the different levels on the checklist, patient caregivers in the NICU may reliably use *The Checklist for Observing Developmentally Supportive Care in the NICU*. The study reliability and validity investigations support Hypothesis 1.

Research Hypotheses 2

Research Hypothesis 2: As measured on the *Checklist for Observing Developmentally Supportive Care in the NICU*, there will be a significant difference between the level of use of developmentally supportive care techniques by the NICU staff pre- and post intervention, dependent upon the time spent on the criteria of selection by the learning organization.

Comparison of DSC in the conceptual areas.

A comparison of indices of the most developmentally supportive levels of DSC in the three conceptual areas was completed. This comparison included all of the observations rated *4* (most supportive level) in Environmental and Individualized Support, and those rated *2* (most supportive level) in Family-Centered Care.

The comparison revealed a significant difference, pre- and post intervention, in the Environmental Support conceptual area, Mann-Whitney $U = 2.92$, ($p < .003$). Given the dialogue and suggestions generated by the learning organization (the intervention), it was not unlikely to see significant positive changes with an increase in level of DSC in the Environmental Support conceptual area. This comparison of changes supports Hypothesis 2 in that the investment of time, and effort, spent on environmental support during the intervention resulted in a significant increase in DSC in that area.

Likewise, the resultant less personal actions planned for the other two conceptual areas demonstrated no significant increases in DSC in Individualized Support, and a significant decrease in Family-Centered Care. The comparison of indices supports the chi-square analyses of the criteria as they are grouped within the conceptual areas. When applied to the 17 criteria, chi-square analyses present an individual picture of each.

Environmental Support.

Each of the criteria in Environmental Support (except *Room Temperature*) showed a significant positive change toward an increase in level of DSC. Data were analyzed with exact chi-square statistics applied to the criteria. The criterion, *Room Temperature* was justifiably disqualified due to inability for staff to control it. When the results are examined in the light of the learning organization's discussion and recommendations in environmental needs assessment and changes, the conceptual area, Environmental Support, does support Research Hypothesis 2.

Individualized Support.

In the conceptual area of Individualized Support, *Cluster Care* and *Hand Position* showed significant differences, however, they were in the direction of less developmentally supportive care. It is noteworthy that if *Level 3* and *Level 4* were combined in *Hand Position*, there would be an increase from the two lower to the two higher levels of DSC. This closer analysis reveals that there is a general increase in DSC in that criterion. The criterion, *Bili-lights*, was disqualified due to low data availability.

In light of discussions in the learning organization, recommendations were made for the increased availability of positioning tools. If these tools were made available, the DSC in this conceptual area may have increased. At this point in time and under the conditions of the present study (in particular, the lack of positioning tools) it cannot conclusively be determined that the change in the conceptual area, Individualized Support, does or does not support Research Hypothesis 2.

Family-Centered Care.

In the conceptual area of Family-Centered Care, there was a significant decrease in *Breastfeeding*. There were also decreases in *Kangaroo Care* and in *Co-bedding* from pre- to post intervention observations, although not significant. For the criterion, *Co-bedding*, there were low numbers of multiple births in the data (5 sets of multiples pre- and 17 sets post). Therefore results in this criterion should not be considered definitive.

Given the results of the discussions in the learning organization, the data may seem to support the general consensus that the nurses do not encourage breastfeeding or

Kangaroo Care. This might have been explained by a slight decrease or no significant change, however, there is a significant decrease in breastfeeding.

One should be cautious in concluding that the learning organization meetings would have caused a significant decrease in breastfeeding within this study. Given the involvement in the meetings and the qualitative aspect of participant observation of the PI, it is possible to conjecture that another variable may have factored into the significant decrease. Although the clinical nurse leaders may have expressed their opinions, their demonstration of care and professionalism toward their patients would not support an effort to suppress DSC. It can be surmised that during post intervention data collection, there may have been an increase in patient census, an absence of staff or personnel who encourage breastfeeding, or some other factor to cause the significant decrease.

At this time point, the data collected in the conceptual area, Family-Centered Care, does support Hypothesis 2. Given the context of the learning organization meetings, it is noted that the clinical nurse leaders did not actively promote the criteria in Family-Centered Care. They did not spend significant time or resources developing interventions or suggestions to increase the level of DSC in this conceptual area. Instead, dialogue time was spent on justifying why they do not actively support these criteria. This upholds the lack of positive change in this area. The clinical nurses made suggestions for the ancillary specialists to support family-centered care rather than the nursing staff. Although there was a significant decrease in breastfeeding, it cannot definitively be concluded that the learning organization was a causative factor, however, this area needs further investigation.

Summary

Discussion and Implications

This study examined a paradigm to promote best practice by putting research and teachable means into the hands of clinical practitioners. Through the use of a learning organization, it gave the clinical nurse leaders a means to actively participate in the education process, to understand the "why" behind DSC, and to decide how to use the information in practice. The study research materials emphasized that families are of prime concern in the conveyance and support of their infants' neonatal care. Education and supportive information must be shared with them as well as with staff.

It is important to monitor the levels of DSC as assurance that the NICU is actually providing the levels of support that it believes it is. This study validated and reliably utilized the new *Checklist for Observing Developmentally Supportive Care in the NICU* to measure the levels of DSC, environmentally, individually, and in regards to family-centered care. This instrument was designed to look at the system of DSC in the NICU. Its purpose was to provide a means for caregivers to assess and evaluate the levels of care in the NICU, to analyze strengths and weaknesses, and to implement an action plan based on their findings. For the purpose of this study, the checklist measured pre- and post intervention levels of DSC in the NICU, to determine the effect of the learning organization (the intervention). The instrument was a response to the call of clinical leaders in the literature in the care of neonates for the development of strategies for a change process in the NICU, including assessment, implementation, and evaluation (Browne, 1999; Graven, 1999).

The inception of the checklist was based on the premise that it would not be used to grade or implicate any individual. The checklist delineates where there are weaknesses in DSC in the NICU. Administration, management and staff may then use that information to make corrections where they are needed, whether in caregiving, providing education, interacting with parents, or supplying materials and supportive personnel.

The use of a learning organization of frontline clinical nurse leaders as a vehicle to promote the latest research in DSC and to teach and review techniques is an assurance that the knowledge is being placed where it needs to be. A learning organization is a method that can be replicated in any NICU with the assistance of the developmental specialist or other ancillary personnel. The clinical nurse leaders provide the link between staff practitioners and managers. Acquisition of the most recent research literature on DSC techniques must be made available to staff. Nursing management also needs to be aware of this knowledge base so that the correct supplies will be available for the staff to provide best practices. The support of administration allows this dynamic structure to move forward with the necessary funding for supplies and for the funding and availability of ancillary personnel.

In unpacking the dynamics of this study, the questions must be asked: Why is it that the learning organization effected positive change in an area in which it was already proficient (i.e. environmentally supportive care), effected relatively no change in areas which involved a more personal commitment (i.e. individualized care), and furthermore, allowed a negative slide in the area of family-centered care? Is this typical of results in other learning organizations? Is this weakness in support of family-centered care typical

of staff in other NICUs? What are the dynamics influencing the lack of support in individualized care and family-centered care?

Group members were enthused and comfortable making improvements in areas that were manipulative of the environment, which did not involve personal values or personal commitments. However, in areas that involved personal values, it seems that they were more apt to look outside of themselves and to lay responsibility on the system. For example, in individualized care, one could "blame" a lack of correct positioning on a lack of available materials. This is an example of Argyris' description (1999) of defensive routines (see p. 33 above), i.e. the organization members prevent themselves from experiencing embarrassment by protecting themselves through a cover-up, in this case blaming. Unfortunately, this also prevents them from discovering the causes of the problem. Argyris termed it "anti-learning" (pp. xiii-xiv). He suggested single- or double-loop learning as an antidote. Single-loop learning would be to identify and change the errors. Theoretically, double-loop learning would ask the following personal questions: Why don't we have the materials? Why can't we ourselves seek the correct materials by requesting a meeting with those who order and pay for the materials? What can we do as a learning organization to effect change and improvement in the system of providing necessary materials for best practice? If we are lacking materials, what can we do to problem-solve, to enhance the positioning of the infants, and to monitor them?

An integration of the insight of the literature with a consideration of the richness of interactions within this learning organization illuminates possible reasons why this group responded in the manner that it did. Reviewing Browne and Smith-Sharpe's article (1995) on stages of change in the NICU (see Chapter II, p. 44 above), the NICU for this

study is between the 4th and 5th stages, *Identity* and *Integration*. In the *Identity* stage, staff is accepting DSC, however it may not have a complete understanding of the rationale and procedures to individualize DSC, including family-centered care. The NICU management at Magee-Womens Hospital has provided in-services and training.

The present study has addressed this stage and further pushed the NICU staff along the trajectory into the 5th stage, *Integration.* The staff is now becoming more aware of its need to expand areas of DSC, however it does need assistance. This was a recommendation by the learning organization, i.e. the need for ancillary staff to assist with teaching breastfeeding and monitoring Kangaroo Care and co-bedding, in addition to providing refresher courses on positioning and proper utilization of positioning tools. As described by the Browne and Smith-Sharpe model, within the stage of *Integration*, staff members now need to transition from the belief that they can accomplish goals by themselves to the belief that infants are collaborators in their own care. In addition, parents are vital collaborators.

As the literature on learning organizations suggests, involving the stakeholders through the learning organization in delineating problems and analyzing them not only emphasizes their shared responsibility, but also causes them to seek solutions and to invest in the change process. The process of *systems thinking* in the ability to see the premise that underpins all of the components of DSC provided the basis for this study's learning organization. Through it, the members should be able to move from "helpless reactors" to "active participants in shaping their reality" (Senge, 1994, p. 69). The clinical nurse leaders in this study made inroads in suggesting how to improve environmental support. They were able to voice the areas that needed improvement. Although it was

more difficult for them to accept the personal challenges to their biases on family-centered care, a move in this direction was made. They suggested that promotion of DSC techniques, particularly family-centered care, should come from ancillary staff members in the unit. They intimated that they will support the research literature in providing family-centered care when asked by a parent, but they will not actively promote breastfeeding, Kangaroo Care and co-bedding. Ego identity was preserved by providing a forum for dialogue and discussion with anonymity. Ego identity was further preserved when the checklist was used to rate the levels of care, not the caregivers. The next steps forward would be single- and double-loop learning, i.e. identifying weaknesses, making changes, asking questions when they need to be asked, and seeking answers.

The use of the PI as a change agent and facilitator within the system was clearly beneficial to the interpretation of results. As described in Havelock's Model of Change, Stage 2, *Examine*, (1995), the PI was able to define both the improvements and the lack of increase in DSC within the context of discussion and dialogue of the learning organization. The learning organization's resultant dialogue shed an understanding on the statistical outcomes. Streubert and Rinaldi Carpenter (1995) pointed out that "through interaction with the system, the researcher also contributes to the body of scientific knowledge about the system" (p. 255), thus serving both theory and practice. In this case, the purpose was to generate practical knowledge so that the system might be improved. The PI served as the connector among the information, the dialogue, and the results in relationship to the members of the learning organization.

The continued use of the learning organization would be of significant value at this time in this NICU. To ensure success, it will require a committed facilitator as well as the

endorsement of managers and administrators. Managers and administrators must endorse research as a tool to encourage growth in DSC. Research by practitioners will encourage professional growth in caregiving through frontline problem identification and problem solving. When research is managed by the members of the NICU through a learning organization endorsed by management, shared commitment will propel the NICU to the final stage in Browne and Smith-Sharpe's model (1995), i.e. *Generation.* Then the NICU staff will be able to integrate developmentally supportive and family-centered care into its philosophy and practice, from individualized care to evaluation. Staff will learn to be flexible and will be able to generate new approaches. At that point, the NICU can proclaim that it truly is developmentally supportive of individualized and family-centered care and that it is offering best practices to its patients and families. Best practices would be used in techniques that are developmentally appropriate, research-based, available, and teachable. This would provide an honest answer to the question and challenge posed by Dr. Stanley Graven at the 1999 international conference, *The Physical and Developmental Environment of the High-Risk Infant*: i.e. *How many of you are from a NICU that uses developmentally supportive care consistently?*

Future Research

An extension of this study would be to continue the learning organization in the Magee-Womens Hospital NICU and to encourage membership of clinical nurse leaders and other staff to address needs of DSC. Some needs are already being addressed within this NICU (e.g. noise levels; acquisition of positioning equipment; scheduled educational

refresher in-services on DSC). It would be interesting to look at values and attitudes in relationship to individualized and family-centered care.

Future research might address the use of the learning organization with a different level of staff members, including medical staff and ancillary staff members. How would the use of inter-generational staff, that is staff members of different ages in different developmental stages of life, influence the outcome of a learning organization? Is there an optimal number of members of a learning organization that is demonstrably influential within the group and to the organization at large? In an article published by Wharton School, Evan Wittenberg (2006), Director of the Wharton Graduate Leadership Program responded that results on optimal membership numbers are not conclusive. He stated that several experts in learning organizations determined that 5 to 12 members are optimal, with 5 to 9 best. The number 6 is often stated. The article acknowledged that it depends on what needs to be done and who the members are (Wharton School, Online).

Although the use of a control group was considered prior to the initiation of this study, scheduling and placement of nurses limited that possibility. It would be advantageous to replicate the study with the use of a control group in a site that would be conducive to that design. What would be the outcome if there were two experimental groups, one receiving the learning organization as intervention, the other receiving a social-based intervention with no educational or learning component, compared with one control group, receiving the status quo of the NICU?

Several areas of research studies may be generated with the use of the *Checklist for Observing Developmentally Supportive Care in the NICU.* It is hoped that the instrument will continue to be used to gather data in this NICU. Staff should be trained to use the

Checklist regularly. Results of data will assist staff with better management and improvement of care delivery.

The checklist is user-friendly for any NICU. It offers allowances for cultural and medical considerations. Future possibilities could be to track individual infants throughout the NICU experience. This would provide a database for longitudinal studies of NICU graduates. DSC could be looked at from the perspective of one conceptual area, or from the perspective of one or several criteria. For example, staff may want to monitor the conceptual area, Family-Centered Care or the single criterion, Kangaroo Care.

A variation of the checklist for collection of parent input is being designed. This checklist may be adapted to instruct parents to provide DSC for their infants while in the NICU and to continue DSC after discharge. This would be an excellent tool to help parents continue to position their infants correctly to prevent contractures or developmental delays and to encourage mental and physical development. Additionally, it would address environmental and attachment and bonding issues.

Future research may address the following questions: Can the results of this study be generalized to other NICUs? What is the best way to integrate a learning organization into the ongoing repertoire of the NICU? Who would provide the most effective membership in the learning organization? Is an internal or an external facilitator more effective? What are the dynamics influencing the lack of DSC in any conceptual area? Is lack of support influenced by personal experience, by factual information that should be investigated, by a combination, or by other factors? Can information generated by the learning organization and the *Checklist for Observing Developmentally Supportive Care in the NICU* at multi-sites be linked to produce an overall picture of DSC in the NICU?

Conclusion

This study linked a learning organization, a change agent, an assessment tool, developmental supplies, and the stakeholders for an effective paradigm to increase DSC in the NICU. Furthermore, it offered a caregiving framework that considered the needs of best practices toward infants in the healthcare system within today's economy, potentially improving satisfaction of both consumers and caregivers. Addressing the challenge of the Transformational Model by Dr. Gail Wolf (2001, Shields Arnold; 2002, Beckwith Institute, Online), this paradigm may be replicated at other NICU sites at costs that are controllable by management and administration.

Effects of this paradigm might include: (a) integration of a higher level of developmental principles in the NICU, (b) the formation of an ongoing learning organization, (c) improved bonding between parents and infants, and (d) a baseline to be used in long-term or repeated studies. In addition to evaluation of DSC in a NICU, implications might include assessment of the use of specific techniques on a large population of infants at multi-sites.

Documentation may undeniably establish the effects of DSC on the medical and developmental outcomes of premature infants, supporting claims of a decrease in overall costs of neonatal care to the medical system. The findings of this study are an indication that when this paradigm is in place, the NICU staff may confidently use its knowledge base of the research literature and of self-assessment to move along the trajectory toward best practice in the support of each infant and his/her family in individualized, developmentally supportive, family-centered care.

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APPENDIX A

Introductory Letter to Staff Prior to Data Collection

Introductory Letter to Nurse Clinical nurse leaders

Demographic Information

Research Registry Form

Developmental Follow-up Clinic
Magee-Womens Hospital
300 Halket Place
Pittsburgh, PA 15213

March 11, 2005

RE: Developmentally Supportive Care Research

Dear Staff,

For the next several weeks, we will have two Masters level developmental specialists collecting data for research in the rooms in which parents have signed the Research Registry. The study will be looking at developmentally supportive care in our new NICU. It is part of doctoral research designed to add to the knowledge base about DSC in the NICU. I am the principal investigator.

The developmentalists will not touch babies or interfere in any care. Privacy of families and staff will not be compromised. There will be no names collected or rooms identified in the study.

The study has the approval of Glenda Davis and of the Duquesne University and UPMC-IRBs. If you have any concerns please contact me.

Thank you for your smiles and your welcome to the developmental specialists.

Most sincerely,

Barbara J. Zapalo, Developmental Specialist
Neonatal Follow-up Clinic
Magee-Womens Hospital
bzapalo@mail.magee.edu

Developmental Follow-up Clinic
Magee-Womens Hospital
NICU
Pittsburgh, PA 15213

Dear (Clinical nurse leader):

It is an exciting time to be a member of the NICU staff at Magee-Womens Hospital now that we have the state-of-the-art Newborn Intensive Care Unit! As you are aware, much research and planning has gone into the development of our new NICU environment, which is based on the literature and research of Developmentally Supportive Care (DSC). This includes individualized care for the infant, family-centered care, care of the staff, and environmental support for infants, families, and staff.

As clinical leaders in the caregiving of our patients and their families, you have been selected to facilitate and promote best practice in DSC through the NICU Learning Organization. Your participation is very important for the development of DSC among the staff that is faced with the challenges of a new work environment.

Through a review of the literature, the NICU Learning Organization has been determined to be an excellent vehicle to promote best practice because it involves you in the decision making process. As part of my doctoral dissertation at Duquesne University, I am conducting a study on the promotion of DSC in the NICU, which will aid in the transition process into the new NICU. This design complements the objectives of the NICU Nursing Administration and is endorsed by Glenda Davis, NICU Patient Care Services Director.

Your participation will involve 5 initial small group meetings, approximately 1¼ hours each, meeting weekly, in which we will actively explore our present practice, reflect on our findings, discuss strengths and weaknesses based on research in DSC, suggest changes, problem solve, and develop action plans. This is your opportunity to spearhead practice so that our NICU truly will be a model not only in architectural design, but also in best practice and professional service to our patients, families, and co-workers.

Please fill out and return the following information. Your selection of day and time will help me to plan our meeting times and groups.

Most sincerely,

Barbara J. Zapalo, M.Ed.
Infant Developmental Specialist
Doctoral Candidate
Duquesne University
Pittsburgh, PA

Name _____

Date _____

Which days and times are most amenable to you to attend the 1 ¼ hour sessions? Please keep in mind that I will do my best to select times that are most conducive to the majority. You may want to discuss this with the other Nurse Clinicians. We can select lunch or dinner times and bring our food to the meetings. Days to select range from Tuesday through Sunday. Please select three choices of days and times.

Choice # 1 _____ at _____

Choice # 2 _____ at _____

Choice # 3 _____ at _____

Demographic Information

Job Title: _____ Circle: Full Time
Part Time

Job Description: _____

Degrees Earned: _____

Years of Nursing Practice: _____

Years in Nursing Supervision: _____

Years of NICU Experience: _____

Years in NICU Supervision: _____

And Ages of Children: _____

Magee-Womens Hospital

of UPMC Health System

300 Halket Street
Pittsburgh, PA 15213-3180

University of Pittsburgh
Institutional Review Board
Approval Date: 01/26/05
Modification Approval Date: 09/19/05
Renewal Date: 01/25/06
IRB #050113

PERMISSION TO BE LISTED IN A RESEARCH REGISTRY

TITLE: Magee-Womens Hospital Research Registry for Women and Infants Health

INVESTIGATORS:
Thelma Patrick, PhD, RN, Assistant Professor, University of Pittsburgh Department of Health Promotion and Development and OB/GYN & Reproductive Sciences, Clinical Research Education and Support Service Office, Magee Womens Hospital, 300 Halket St. Pittsburgh, PA 15213 (412) 641-6004

MWH Research Registry for Women and Infants Health Investigators (This includes members of the University of Pittsburgh School of Medicine and Magee-Womens Hospital Medical Staff. A complete, current listing is available upon request.)

What is the purpose of this research registry?
Many advances in medicine have come from looking at the medical charts of people with certain diseases or conditions and learning from this information. We are asking for your permission to put information about you and if applicable, your baby, in a Women and Infants Health Research Registry. This research registry will allow us to look at medical charts to learn about diseases that particularly affect women and infants. It will also be used to find patients, such as you, who may want to take part in research studies on women and infants health.

Who is being asked to participate in this research registry?
Patients who come to Magee-Womens Hospital (MWH) or go to a provider affiliated with MWH are being asked to participate in this research registry for Women and Infants Health.

What will my participation in this research registry involve?
If you agree to participate in this research registry, your Magee and associated physicians medical charts and if applicable, that of your baby may be looked at by researchers to see if you qualify to take part in research studies approved by the University of Pittsburgh Institutional Review Board (IRB). You may then be contacted by a researcher who will talk to you about a specific study. If you sign up now for the research registry, you still can refuse to take part in any research study that these people talk to you about. And if you decide to take part in any research study, you will have to sign a separate permission form for that study. By agreeing to participate in the research registry, you also agree to let researchers look at and use information in your medical records or if applicable, that of your baby for a "chart review" research study, which means they do not contact you, and you do not have to do anything else for the study.

How much of my medical record information will be placed in the research registry?
Any part of your medical record that is related to your and if applicable, your baby's health care provided at Magee-Womens Hospital may be looked at through the research registry.

University of Pittsburgh
Institutional Review Board
Approval Date: 01/26/05
Modification Approval Date: 09/19/05
Renewal Date: 01/25/06
IRB #050113

Who will have access to my and/or my baby's identifiable medical record information contained in the research registry?
In addition to the MWH research registry for Women and Infants Health investigators, authorized representatives of the University of Pittsburgh Institutional Review Board and of the University of Pittsburgh Research Conduct and Compliance Office may review information contained within the research registry to ensure that the research registry adequately protects your privacy. People from the agencies that give money for this research may also look at your records in order to check-up on the project. Also, in unusual cases, your research records may be seen by appropriate government agencies, such as the US Food and Drug Administration, or be released in response to an order from a court of law.

For how long will my medical record information continue to be placed in the research registry and for how long will this information be used for research purposes?
We will continue to include your and if applicable, your baby's medical record information in the research registry indefinitely unless you take back your permission for participation in the research registry.

Is my participation in the research registry voluntary?
Your participation in the research registry is completely voluntary. Whether or not you provide your permission for participation in this research registry will have no affect on you or your baby's current or future medical care at MWH or related health care provider.

May I withdraw, at a future date, my consent for participation in this research registry?
If you change your mind, you can withdraw from the research registry at any time. There will then be no additional collection of your medical record information and no further use for the research purposes described above. However, any research use of your medical record information before the date that you withdraw your permission will not be destroyed. To withdraw, you need to write a letter to the Principal Investigator listed above which says that you wish to withdraw. Withdrawing from this research registry will not change you or your baby's care and benefits at MWH.

What are the possible risks of my participation in the research registry?
There are no risks of physical injury associated with taking part in the MWH Research Registry for Women and Infant's Health. Only approved investigators associated with the research registry and their research staff will see personal information about you or your baby that is contained within the research registry. However, there is a possible risk that information about your health and that of your baby might become known to individuals other than research registry investigators.

What are the possible benefits of my participation in the research registry?
There are no anticipated benefits; however a possible benefit is that you or your baby may be eligible to take part in an approved research study concerning Women and Infants Health.

Will I be paid for my participation in the research registry?
You will not receive any money for participating in this research registry.

University of Pittsburgh
Institutional Review Board
Approval Date: 01/26/05
Modification Approval Date: 09/19/05
Renewal Date: 01/25/06
IRB #050113

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VOLUNTARY CONSENT:

All of the above has been explained to me and all of my current questions have been answered. I understand that I am encouraged to ask questions about any aspect of this research registry, and that such future questions will be answered by the researchers listed on the first page of this form. Any questions I have about my rights as a research participant will be answered by the Human Subject Protection Advocate of the IRB Office, University of Pittsburgh (1-866-212-2668).

By signing this form, I agree to my and my infant's participation in this research study. A copy of this consent form will be given to me.

_____	_____	_____
Printed Name of Subject	Subject's Signature	Date

CERTIFICATION OF INFORMED CONSENT (required):
I certify that I have explained the nature and purpose of the Women and Infants Health Research Registry to the above-named individual, and I have discussed the possible risks and potential benefits of participation in this Research Registry. Any questions the individual has about this Research Registry have been answered, and the physicians and research staff associated with Women and Infants Health will be available to address future questions as they arise.

_____	_____	_____
Printed Name of Person Obtaining Consent	Signature of Person Obtaining Consent	Date

CONSENT FOR CONTINUED RESEARCH PARTICIPATION (required only if already a participant):
I understand that I am currently participating in a research study. I further understand that consent for my participation in this research study was initially obtained from my authorized representative as a result of my inability to provide direct consent at the time that this initial consent was requested. I have now reached the age of 18 and am able to provide direct consent for continued participation in this research study.

By signing below, I agree to continue my participation in this research registry. A copy of this consent form will be given to me.

_____	_____
Participant's Signature	Date

APPENDIX B

Checklist for Observing Developmentally Supportive Care

in the NICU

Checklist for Observing Developmentally Supportive Care in the NICU

Date: _____ Time: _____ # Infants: _____ Pod: _____

Environmental Support:

1. Diurnal Pattern
_____ Lights are on constantly.
_____ Lights are on/off at random.
_____ Lights are appropriate to time of day: on in the a.m. and dimmed in the p.m.
_____ Lighting patterns are adapted to each infant's needs.

2. Shielding from Light
_____ Bed is not covered.
_____ Bed is partially covered. Infant is not shielded from light.
_____ Infant is partially shielded from light.
_____ Infant is shielded from light.

3. Noise Level
_____ Highest reading of noise level is at or above 75 dB.
_____ Highest reading of noise level is between 66-74 dB.
_____ Highest reading of noise level is between 60-65 dB.
_____ Noise level is at or below 59 dB.

4. Communicative Voices
_____ Loud conversation.
_____ Ongoing conversation/background distant conversation.
_____ Conversation 50% of the time in the room.
_____ Conversation less than 50% of the time in room/no conversation.

5. Room Temperature
_____ Room temperature is below 72 degrees F.
_____ Room temperature is at/between 72-78 degrees F.
_____ Room temperature is above 78 degrees F.

Individualized Support:

6. Cluster Care
_____ Cluster care is not observed.
_____ Infant is awakened for care.
_____ Single care is given at infant's self-arousal.
_____ Cluster care is performed. Infant shows signs of being overwhelmed (color change, hand over face, apneic or bradycardic episode).
_____ Cluster care is performed according to infant's cues. Containment is used.

7. Positioning
_____ Positioning tools are not present.
_____ Positioning tools are not being utilized correctly/Tools need adjusted.
_____ Infant is positioned in the positioning tools or infant is being held, but infant needs adjustment.
_____ Infant is properly positioned or held properly (flexed and aligned).

8. Baby Bendy
_____ Baby Bendy is not used/is used improperly—not close to infant.
_____ Wrong size Baby Bendy is used.
_____ Infant is positioned in the appropriate size Baby Bendy, but he/she needs adjustment.
_____ Infant is properly positioned (flexed and aligned) in the appropriate size Baby Bendy.

9. SnuggleUp
_____ SnuggleUp is not used.
_____ Wrong size SnuggleUp is used or infant is positioned incorrectly.
_____ Infant is positioned in the SnuggleUp, but needs adjustment.
_____ Infant is properly positioned (flexed and aligned) in the appropriate size SnuggleUp.

10. Hand position _____ Hands are tucked due to medical consideration. _____ Hands are tucked or swaddled away from infant's midline. _____ Hands are swaddled midline, but out of infant's reach. _____ Hands are available to infant, but not supported midline. _____ Hands are midline and available for sucking or infant is prone with hand by face.	11. Pacifier _____ No pacifier, by parents' request/medical consideration. _____ Pacifier is not offered when infant is crying. _____ Pacifier is in bed. _____ Pacifier is near infant's face. _____ Pacifier is offered/Infant is sucking on pacifier.
12. Bili-lights _____ Not observed. Bili-lights are not being used. _____ Eyes are not shielded. _____ Eyes are shielded.	13. Containment and Positioning during Feeding (within bed or out of bed) _____ Feeding was not observed. _____ No attempt to contain or position the infant. _____ Infant is positioned improperly (not flexed or contained). _____ Infant is positioned but no attention is paid to his/her cues (suck/swallow/breathe). _____ Infant is positioned and contained properly and attention is paid to his/her cues.
14. Containment and Positioning during Painful Procedure. _____ Procedure was not observed. _____ No attempt to contain or position the infant. _____ Infant is positioned improperly (not flexed or contained). _____ Infant is positioned but no attention is paid to his/her cues (crying, color change, hand over face). _____ Infant is positioned and contained properly. Adjustments are made according to his/her cues.	
Family-Centered Care:	
15. Breastfeeding _____ Nothing is allowed by mouth (medical consideration). _____ Infant is not given breast milk. _____ Infant is breastfed or given breast milk.	16. Kangaroo Care. _____ Infant is not stable enough for Kangaroo Care (medical consideration). _____ Family is not participating in Kangaroo Care. _____ Family is participating in Kangaroo Care.
17. Co-bedding. _____ Infants are not stable enough co-bed (medical consideration). _____ Infants are not co-bedded. _____ Infants are co-bedded.	

References on the *Checklist for Observing Developmentally Supportive Care in the NICU,* Listed by Criterion:

Environmental Support:

1. Diurnal pattern is used—Lighting patterns are adapted to infant's needs.

American Academy of Pediatrics (1999). Recommended standards for newborn ICU design. (Standards 14 & 17). *Journal of Perinatology 19*(8) Part 2, S8-S10. NY: Stockton Press.

Fajardo, B., Browning M., Fisher, D., & Paton, J. (1990). Effect of nursery environment on state regulation in very-low-birth-weight premature infants. *Infant Behavior and Development, 13,* 287-303.

Glotzbach, S. Edgar, D., & Ariagno, R. (1995). Biological rhythmicity in preterm infants prior to discharge from neonatal intensive care. *Pediatrics 95*(2), 231-237.

Lefrak-Okikawa, L., & Houska Lund, C. (1993). Nursing practice in the neonatal intensive care unit. In M. Klaus & A. Fanaroff (Eds.), *Care of the high-risk neonate* (4th ed., p. 214). Philadelphia: W.B. Saunders Company.

Mann, N., Haddow, R. Stokes, L., Goodley, S., & Rutter, N. (1986). Effects of night and day on preterm infants in a newborn nursery: Randomized trial. *British Medical Journal, 293,* 1265-1267.

Miller, C., White, R., Whitman, T., O'Callaghan, M., & Maxwell, S. (1995). The effects of cycled vs. noncycled lighting on growth and development in preterm infants. *Infant Behavioral Development, 18,* 87-95.

Thomas, K. (1995). Biorhythms in infants and role of the care environment. *The Journal of Perinatal and Neonatal Nursing 9*(2), 61-75.

Updike, P., Accurso, F., & Jones, R. (1985). Physiologic circadian rhythmicity in preterm infants. *Nursing Research 34*(3). 160-163.

2. Infant is shielded from light.

American Academy of Pediatrics (1997). *Guidelines for perinatal care* (4th ed.). Washington, DC: American College of Obstetricians and Gynecologists.

American Academy of Pediatrics (1999). Recommended standards for newborn ICU design. (Standards 14-17). *Journal of Perinatology 19*(8) Part 2, S8-S10. NY: Stockton Press.

Lefrak-Okikawa, L., & Houska Lund, C. (1993). Nursing practice in the neonatal intensive care unit. In M. Klaus & A. Fanaroff (Eds.), *Care of the high-risk neonate* (4th ed., p. 214). Philadelphia: W.B. Saunders Company.

Vandenburg, K. (1995). Behaviorally supportive care for the extremely premature infant. In L. P. Gunderson & C. Kenner (Eds.), *Care of the 24-25 week gestational age infant: A small baby protocol* (2nd ed., pp. 164-167). Petaluma, CA: NICU Ink.

Young, J. (1996). The visual system. In *Developmental care of the premature baby.* (pp. 21-32, 105-106). London: Bailliure Tindall.

3. Noise level is at or < 59 dB.

4. Communicative voices are kept soft. There is minimal conversation.

American Academy of Pediatrics (1999). Recommended standards for newborn ICU design. (Standard 23). *Journal of Perinatology 19*(8) Part 2, S11-S12. NY: Stockton Press.

Lefrak-Okikawa, L., & Houska Lund, C. (1993). Nursing practice in the neonatal intensive care unit. In M. Klaus & A. Fanaroff (Eds.), *Care of the high-risk neonate* (4th ed., p. 214). Philadelphia: W.B. Saunders Company.

Philbin, M. K., Robertson, A., & Hall III, J. (1999). Recommended permissible noise criteria for occupied, newly constructed or renovated hospital nurseries. *Journal of Perinatology 19*(8) Part 1, 559-563. NY: Stockton Press.

Robertson, A., Cooper-Peel, C., & Vos, P. (1999). Contribution of heating, ventilation, and air conditioning airflow and conversation to the ambient sound in a neonatal intensive care unit. *Journal of Perinatology 19*(5), 362-366. NY: Stockton Press.

Robertson, A., Cooper-Peel, C., & Vos, P. (1999). Sound transmission into incubators in the neonatal intensive care unit. *Journal of Perinatology 19*(7), 495-497. NY: Stockton Press.

Young, J. (1996). The auditory system. In *Developmental care of the premature baby.* (pp. 33-41, 107-108). London: Bailliure Tindall.

5. Room temperature is maintained between 72-78 degrees F.

American Academy of Pediatrics (1999). Recommended standards for newborn ICU design. (Standard 22). *Journal of Perinatology 19*(8) Part 2, S11. NY: Stockton Press.

Individualized Support:

6. Cluster care is performed according to infant's cues. Containment is used.

Als, H., & Gilkerson, L. (1997). The role of relationship-based developmentally supportive newborn intensive care in strengthening outcome of preterm infants. *Seminars in Perinatology 21*(3), 178-189.

Becker, P., Grunwald, P., Moorman, J., & Stuhr, S. (1991). Outcomes of developmentally supportive nursing care for very low birth weight infants. *Nursing Research 40*(3), 150-155.

Hadley, L., West, D., Turner, A., & Santangelo, S. (1999). *Developmental and behavioral characteristics of preterm infants.* Santa Rosa, CA: NICU INK.

Harrison, L. (1997). Research utilization: Handling preterm infants in the NICU. *Neonatal Network 16*(3), 65-69.

Long, J., Philip, A., & Lucey, J. (1980). Excessive handling as a cause of hypoxemia. *Pediatrics 65*(2), 203-207.

Young, J. (1996). The somatosensory system. In *Developmental care of the premature baby.* (pp. 42-59, 108-111). London: Bailliure Tindall.

7. Infant is properly positioned or held properly (flexed and aligned).
8. Infant is properly positioned (flexed and aligned) in the appropriate size Baby Bendy.
9. Infant is properly positioned (flexed and aligned) in the appropriate size SnuggleUp.

Becker, P., Grunwald, P., Moorman, J., & Stuhr, S. (1993). Effects of developmental care on behavioral organization in very-low-birth-weight infants. *Nursing Research 42*(4), 214-220.

Fern, D. (1998). Developmentally appropriate positioning. A poster demonstrating positioning products based on overall goals of positioning. South Weymouth, MA: Children's Medical Ventures, Inc.

Hunter, J. (1999). Therapeutic positioning in the NICU. In *Developmental care in depth: From womb to home.* Pre-conference workshop at the 1999 international conference, *The Physical and Developmental Environment of the High-Risk Infant,* January 27-30, 1999. Clearwater Beach, FL.

Koch, S. (1999). Developmental support in the neonatal intensive care unit. In J. Deacon & P. O'Neill (Eds.), *Core curriculum for neonatal intensive care nursing* (2nd ed., pp. 527-529). Philadelphia: W.B. Saunders Company.

Lefrak-Okikawa, L., & Houska Lund, C. (1993). Nursing practice in the neonatal intensive care unit. In M. Klaus & A. Fanaroff (Eds.), *Care of the high-risk neonate* (4th ed., pp. 215-216). Philadelphia: W.B. Saunders Company.

Young, J. (1996). Neuromotor development. In *Developmental care of the premature baby.* (pp. 60-85, 111-113). London: Bailliure Tindall.

10. Hands are midline and available for sucking or infant is prone with hand by face.

11. Pacifier is offered/Infant is sucking on pacifier.

Franck, L., & Lawhon, g. (1998). Environmental and behavioral strategies to prevent and manage neonatal pain. *Seminars in Perinatology 22*(5), 434-443.

Gill, N., Behnke, M., Conlon, M., McNeeley, J., & Anderson, G. (1988). Effect of nonnutritive sucking on behavioral state in preterm infants before feeding. *Nursing Research 37,* 347-350.

Jorgensen, K. (1999). Pain assessment and management in the newborn infant. *Journal of PeriAnesthesia Nursing 14*(6), 349-356.

McCain, G. (1992). Facilitating interactive awake states in preterm infants: A study of three interventions. *Nursing Research 41,* 157-160.

Porter, E., & Anderson, G. (1979). Non-nutritive sucking during tube feedings: Effect on clinical course in premature infants. *Journal of Obstetrics, Gynecologic and Neonatal Nursing 8,* 265-272.

12. Eyes are shielded (if bili-lights are being used).
(See references for Criterion #2 above).

13. Containment and positioning are used during feeding.

14. Containment and positioning are used during painful procedure.

Als, H. (1982) Towards a synactive theory of development: Promise for the assessment of infant individuality. *Infant Mental Health Journal 3*(4), 229-243.

Als, H., Lawhon, g., Brown, E., Gibes, R., Duffy, F., McAnulty, G., & Blickman, J. (1986). Individualized behavioral and environmental care for the very low birth weight preterm infant at high risk for bronchopulmonary dysplasia: Neonatal intensive care unit and developmental outcome. *Pediatrics 78*(6), 1123-1132.

American Academy of Pediatrics & Canadian Paediatric Society (2000). Prevention and management of pain and stress in the neonate. *Pediatrics 105*(2), 454-461.

Corff, K., Seideman, R., Venkataraman, P., Lutes, L., & Yates, B. (1995). Facilitated tucking: A nonpharmacologic comfort measure for pain in preterm neonates. *Journal of Obstetric, Gynecologic and Neonatal Nursing 24*(2), 143-147.

Franck, L. & Lawhon, G. (1998). Environmental and behavioral strategies to prevent and manage neonatal pain. *Seminars in Perinatology 22*(5), 434-443.

Johnston, C. Stevens, B., Franck, L., Jack, A., Stremler, R., & Platt, R. (1999). Factors explaining lack of response to heel stick in preterm newborns. *Journal of Obstetric, Gynecologic and Neonatal Nursing 28*(6), 587-594.

Jorgensen, K. (1999). Pain assessment and management in the newborn infant. *Journal of PeriAnesthesia Nursing 14*(6), 349-356.

Sparshott, M. (1997). *Pain, distress and the newborn baby.* Oxford: Blackwell Science.

Family-Centered Care:

15. Infant is breastfed or given breast milk.

American Academy of Pediatrics (1997). Breastfeeding and the use of human milk. *Pediatrics 100*(6), 1035-1039.

Jones Wessel, J., & Kleeman, T. (1995). Nourishing the gestationally immature infant. In L. Porter Gunderson & C. Kenner (Eds.), *Care of the 24-25 week gestational age infant* (2nd ed., pp. 90-91). Petaluma, CA: NICU INK.

Schanler, R., Hurst, N., & Lau, C. (1999). The use of human milk and breastfeeding in premature infants. *Clinics in Perinatology. 26*(2), 379-398.

16. Family is participating in Kangaroo Care.

Kangaroo Care Congress Report. (1999). In The NANN pages. *Neonatal Network 18*(4), 55-56.

Legault, M. & Goulet, C. (1995). Comparison of kangaroo and traditional methods of removing preterm infants from incubators. *Journal of Obstetric, Gynecologic and Neonatal Nursing 24*(6), 501-506.

Messmer, P., Rodriguez, S., Adams, J., Wells-Gentry, J., Washburn, K., Zabaleta, I., & Abreu, S. (1998, May/June). Effect of kangaroo care on sleep time for neonates. *Neonatal Intensive Care,* 31-43.

Neu, M. (1999). Parents' perception of skin-to-skin care with their preterm infants requiring assisted ventilation. *Journal of Obstetric, Gynecologic and Neonatal Nursing 28*(2), 157-164.

17. If multiples, infants are co-bedded.

Hedberg Nyquist, K., & Lutes, L. (1998). Co-bedding twins: A developmentally supportive care strategy. *Journal of Obstetric, Gynecologic and Neonatal Nursing 27*(4), 450-456.

Lutes, L. (1996). Bedding twins/multiples together. *Neonatal Network 15(7)*, 61-62.

APPENDIX C

The Learning Organization Module

Magee-Womens Hospital
Neonatal Intensive Care Unit
Learning Organization

Membership: NICU Nurse Clinical nurse leaders

I. What is the purpose of the NICU Learning Organization?

Goals:

1. To model to and to be able to support the NICU staff in the use of Developmentally Supportive Family-Centered Care (DSC) as *best practice.*
2. To develop a Gold Standard Unit for DSC in the United States.

Specific Objectives:

a. Meet weekly within the Learning Organization.
   - Select one of three given meeting times
   - Meet for 1 ¼ hours per wk for 6 wks
   - Compensation – Education Credits

b. Of a given list of 17, select criteria that need most improvement in the NICU.
c. Review the literature on best practice techniques for the selected criteria to determine the "why" and to determine the tenets of the techniques.
d. Make up a mini-assessment for each of the selected criteria.
e. Journal, discuss, dialogue, and problem solve to determine how to improve the use of each technique.
f. Develop practical and creative methods to re-teach and to model the techniques in the NICU.
g. Use mini-assessments to assess the NICU.
h. Use the methods in the NICU.
i. Meet, discuss, and develop protocols.

II. What will help us to be most effective?

- Being Open to Change
- Keeping ourselves and our staff educated in *best practices*

- Being Flexible
- Communication, Communication, Communication
- Developing a Healthy Attitude
- Identifying Attitudes within selves and dealing with them
- Identifying Attitudes of Co-workers and dealing gently
- Identifying Attitudes of Parents and dealing gently

III. Using Effective Tools

- Journaling
- Sharing Words of Encouragement
- Using Discussion
- Using Dialogue
- Learning Problem Solving Techniques
- Having Relaxation Techniques – e.g. Music Therapy
- Taking Refreshments
- Putting Suggestions into Action
- Developing a specific plan
- Following a timeline
- Assessing the plan

Prepared by B. Zapalo, 6/10/05

Magee-Womens Hospital
Neonatal Intensive Care Unit

AGENDA: Clinician Meeting –Learning Organization

I. Poster: *Think Outside the Bowl*

II. Video: *Gone Through Any Changes Lately?*

III. Developmentally Supportive/Family-Centered Care—Overview
- Environmental Support
  - Diurnal Pattern
  - Noise in the NICU
  - Temperature in the Rooms
- Individualized Support
  - Positioning, Positioning, Positioning

IV. Think, Pair, Share
- Family-Centered Care
  - Breastfeeding
  - Kangaroo Care
  - Co-bedding Multiples

V. Expectations: Implementing Developmentally Supportive Techniques

VI. Journaling

VII. Closure

Prepared by B. Zapalo, 8/05

Meeting I – Learning Organization

Objective: The Clinical nurse leaders will understand the purpose of the Learning Organization:

1. As a management team, the Learning Organization will realize its potential to motivate the staff to support Developmentally Supportive Care practices. This will help to provide state-of-the-art service (Gold Standard Unit).

2. The Learning Organization will review the research on best practice techniques and determine methods to integrate these into the current practice in the NICU.

3. The Learning Organization will develop ongoing ways to assess the adopted techniques.

4. The Learning Organization will meet on a regular basis or more often as needed.

Prepared by B. Zapalo, 8/05

Meeting I – Learning Organization

Reflective Journaling:

1. Select three criteria from the list of developmentally supportive care topics, listed below, that we are accomplishing consistently in our NICU. Explain your selections.
2. Select three criteria from the list of developmental care topics that need improvement for consistent care in our NICU. Explain your selections.
3. From the list below, are there any criteria that you feel are unnecessary? Explain why.

Developmentally Supportive Care

Environmental Support:

1. Diurnal pattern – Adjusting lighting patterns to the time of day with consideration of each infant's needs.
2. Shielding infant from direct light
3. Keeping noise level down
4. Keeping conversation to a minimum and voices at a low level
5. Keeping room temperature between 72 – 78 degrees F

Individualized Support:

6. Cluster care is performed with consideration of the infant's cues
7. Infant is positioned properly when placed into bed
8. Baby Bendy is used properly: Infant is flexed and aligned
9. SnuggleUp is used
10. Infant's hands are midline and available for sucking; if infant is prone, hand is near face
11. Pacifier is available
12. Eyes are shielded from bili-lights
13. Infant is positioned properly when feeding – whether in or out of bed
14. Infant is positioned and contained properly during painful procedures: Adjustments are made according to infant's cues

Family-Centered Care

15. Breastfeeding is encouraged
16. Kangaroo Care is encouraged
17. Co-bedding of multiples is encouraged

Prepared by B. Zapalo, 8/05

DEVELOPMENTALLY SUPPORTIVE/FAMILY-CENTERED CARE IN THE NICU
Environmental Support

Diurnal Pattern – Tenets and Research Findings

- "Circadian rhythms are endogenously" (inherited) "generated rhythms with a period length of approximately 24 hours..." (Rivkees, 2003, p. 373). (Examples: sleep-wake cycle, daily rhythms in body temperatures and day-night rhythms in hormone production such as cortisol, melatonin, gonadotropin, testosterone, growth hormone and thyrotropin) (Thomas, 1995).
- "Although pacemaker rhythm is automatic, the rhythm can be influenced by environmental factors (exogenous or external). The process by which the individual's internal rhythm is changed by external environmental factors is termed *entrainment.* Entrainment involves becoming synchronized with or becoming 'hooked into' the environment" (Thomas, 1995, p. 63).
- "*Zeitgeber,* meaning 'time giver,' is the term for environmental factors that influence internal rhythms. Examples of zeitgebers include feeding schedule, activity pattern, environmental time cues, social contacts, and even knowledge of clock time" (Thomas, 1995, p. 63).
- "…Exposure of premature infants to low-intensity cycled lighting results in the early establishment of rest-activity patterns that are in phase with the 24-hour light-dark cycle" (Rivkees, 2003, p. 373).
- "The paired suprachiasmatic nuclei (SCN) in the anterior hypothalamus are the site of a biological clock. The SCN are located above the optic chiasm at the base of the third ventricle. The SCN exhibit endogenous rhythmicity and have a period of oscillation close to 24 hours" (Rivkees, 2003, p. 373).
- "Because SCN oscillations are not exactly 24 hours, it is necessary to reset the circadian pacemaker each day to prevent endogenous clock oscillations from drifting (or free-running) out of phase with the external light-dark cycle" (Rivkees, 2003, p. 374).
- Evidence suggests: neural substrates for the infant clock are in place early in gestation (Glotzbach, Edgar, & Ariagno, 1995).
- By the third trimester, fetal diurnal rhythms are entrainable by maternal day-night rhythms (Mirmiran & Ariagno, 2000).
- "There is evidence that an endogenous circadian rhythm of sleep develops spontaneously in the human infant but that alternating light and darkness hastens its appearance and sychronises it to night and day…This sequence is…delayed in preterm infants" (Mann, Haddow, Stokes, Goodley, & Rutter, 1986, p. 1266).
- The classic study by Mann, et al. (1986) found that exposure to light-dark cycles improves premature infant weight gain and more sleep than chaotic lighting patterns. These results were seen 6 weeks after discharge.

- It has been suggested that the observed effects may not have been a direct result of cycled lighting (Mirmiran & Ariagno, 2000).
- Further studies revealed that "circadian phase can be detected in infants who were exposed to cycled lighting as early as a postmenstrual age of 34 weeks…Most important, we found that day-night differences in activity could be detected several weeks before it was possible to detect circadian rhythms in core temperature using internal telemetry devices. Thus, analysis of rest-activity patterns may provide the earliest index of developing circadian rhythmicity in infants" (Rivkees, 2003, p. 379).
- "…interventions must be carried out in the context of the maturity of the infant circadian system and knowledge of its interaction with other control systems that are developing in parallel" (Glotzbach, 1995, p. 235).
- We must investigate the relationship of infant biological rhythmicity with sleep maturation. "Fragmentation of infant sleep in the NICU secondary to caregiving procedures may underlie neurodevelopmental problems that are common in preterm infants in the postneonatal period and beyond" (Glotzbach et al., 1995, p. 235).
- "Increasing evidence indicates that the circadian timing system is a fundamental homeostatic system that potently influences human behavior and physiology throughout development…Recent evidence shows that the circadian system of primate infants is responsive to light at very premature stages and that low-intensity lighting can regulate the developing clock" (Rivkees, 2003, p. 380).
- A recent study by Rivkees, Mayes, Jacobs, and Gross (2004) found that "exposure to cycled lighting for 2 weeks or more before discharge induces distinct patterns of rest-activity in preterm infants that are in synchrony with the light-dark cycle" (p. 833).
- The same study (Rivkees et al., 2004) found that "the appearance of day-night differences in activity is delayed in infants who are kept in dim, uncycled lighting before discharge" (p. 833).
- "With the continued elucidation of circadian system development and influences on human physiology and illness, it is anticipated that considerations of circadian biology will become an increasingly important component of neonatal care" (Rivkees, 2003, p. 380).
- Presently, the American Academy of Pediatrics recommends cycled light for the development of circadian organization and/or an increase in sleep time for neonates in intensive care (American Academy of Pediatrics, 1999).

Resources for Diurnal Pattern/Circadian Rhythm:

American Academy of Pediatrics (1999). Recommended standards for newborn ICU design. (Standards 14 & 17). *Journal of Perinatology 19*(8) Part 2, S8-S10. NY: Stockton Press.

American Academy of Pediatrics (January 2002). Recommended standards for newborn ICU design, 5th Ed. (Standards 14 & 17). Report of the Fifth Consensus Conference on Newborn ICU Design. Clearwater Beach, Florida. Retrieved August 26, 2002, from http://www.nd.edu/~kkolberg/DesignStandards.htm

Fajardo, B., Browning M., et al. (1990). Effect of nursery environment on state regulation in very-low-birth-weight premature infants. *Infant Behavior and Development, 13,* 287-303.

Glotzbach, S. Edgar, D., & Ariagno, R. (1995). Biological rhythmicity in preterm infants prior to discharge from neonatal intensive care. *Pediatrics 95*, 231-237.

Lefrak-Okikawa, L. & Houska Lund, C. (1993). Nursing practice in the neonatal intensive care unit. In M. Klaus & A. Fanaroff (Eds.), *Care of the high-risk neonate* (4th ed., p. 214). Philadelphia: W.B. Saunders Company.

Mann, N., Haddow, R. Stokes, L., Goodley, S. & Rutter, N. (1986). Effects of night and day on preterm infants in a newborn nursery: Randomized trial. *British Medical Journal, 293,* 1265-1267.

Miller, C., White, R., Whitman, T., O'Callaghan, M., Maxwell, S. (1995). The effects of cycled vs. noncycled lighting on growth and development in preterm infants. *Infant Behavior and Development, 18,* 87-95.

Mirmiran M., Baldwin, R. B. & Ariagno, R. L. (2003). Circadian and sleep development in preterm infants occurs independently from the influences of environmental lighting. *Pediatric Research, 53,* 933-938.

Mirmiran M., Ariagno, R. L. (2000, August 24). Influence of light in the NICU on the development of circadian rhythms in preterm infants. *Seminars in Perinatology*, 247-257.

Rivkees, S. A. (2003, August). Developing circadian rhythmicity in infants. *Pediatrics 112*, 373-381.

Rivkees, S. A., Mayes, L., Jacobs, H., & Gross, I. (2004, April). Rest-activity patterns of premature infants are regulated by cycled lighting. *Pediatrics 113*, 833-839.

Thomas, K. (1995). Biorhythms in infants and role of the care environment. *The Journal of Perinatal and Neonatal Nursing 9*, 61-75.

Updike, P., Accurso, F., & Jones, R. (1985). Physiologic circadian rhythmicity in preterm infants. *Nursing Research 34*, 160-163.

Prepared by B. Zapalo, 8/05

Worksheet for Diurnal Pattern

1. Journaling.

    a. According to the research and using the assessment below, how would you assess present practice in our NICU? Rate one or two rooms.

    Assessment for the use of Diurnal/Nocturnal Pattern
    _____ Lights are on constantly.
    _____ Lights are on/off at random.
    _____ Lights are appropriate to time of day: on in the a.m., dimmed in the p.m.
    _____ Lighting patterns are adapted to each infant's needs.

    b. Considering the research and the recommendations, what could we do to improve the situation? Write at least 2-3 suggestions.

2. Discussion.
3. Dialogue/Problem Solve.
4. Plan.
    a. Write/plan at least 3 interventions to actively promote diurnal/nocturnal patterns.
    b. Write an assessment to derive a baseline of practice and to compare practice after interventions.

    (5 will be completed before next meeting; 6 and 7 will be addressed at next meeting.
5. Implement Plan. Use Assessment Tool.
6. Critique Plan and Make Necessary Changes. Implement New Plan.
7. Write Protocol.

Prepared by B. Zapalo, 8/05

Magee-Womens Hospital
Neonatal Intensive Care Unit
Learning Organization

AGENDA: Environmental Support

I. Sign in sheet

II. Demographic Information – need 2

III. Contact information: Barbara Zapalo, M.Ed., Development Specialist, Neonatal Follow-up Clinic: x4855; (724) _____; bzapalo@mail.magee.edu

IV. Poster: *Think Outside the Bowl*

V. Gold-Standard Unit

VI. Noise in the NICU: Review the Literature

VII. Journaling Activity

VIII. Using the Dosimeter

IX. Pair – Share

X. Discussion

XI. Dialogue/Problem Solve: Think Outside the Bowl

XII. Plan

XIII. Closure – Next Meeting

Prepared by B. Zapalo, 8/05

DEVELOPMENTALLY SUPPORTIVE/FAMILY-CENTERED CARE IN THE NICU
Environmental Support

Noise Level in the NICU – Tenets and Research Findings

- Medically fragile infants experience physiological effects related to excessive noise exposure. Studies have demonstrated heart-rate and respiratory changes, an increase in EEG response threshold, an increase in intracranial pressure and a decrease in transcutaneous oxygen tension. (Morris, Philbin, & Bose, 2000).

- A literature review by Levy, Woolston, & Browne (2003) listed several studies which have found "potential health hazards in the NICU related to excessive noise exposure…Research indicates that considerable physical and mental health hazards are associated with high amounts of NICU noise" (p. 33). Some of these hazards are:
    - There is disruption of infant sleep patterns essential for typical neurologic and synaptic development (Strauch, Brandt, & Edwards-Beckett, 1993).
    - In utero infant sleep is for a majority of uninterrupted time contrasted to NICU infant sleep which is interrupted an average of 132 times in 24 hours (Strauch et al., 1993).
    - Results of sleep deprivation are hypothesized to alter brain function and to interfere with healing.
    - Exposure to NICU noise is related to anoxia and bradycardia and negatively impacts blood pressure, heart rate, perfusion, oxygen saturation, and cerebral blood flow.
    - There is a higher risk of intraventricular hemorrhage, which may lead to developmental disabilities such as cerebral palsy, behavioral disorders, intellectual impairment, neurologic abnormalities, motor problems or learning disabilities.
    - Due to neurologic immaturity and physiologic instability, extremely vulnerable infants are susceptible to the most noxious noise, which may result in neurologic damage and problematic brain organization.
    - Uninterrupted loud noise can cause significant hearing damage to the most fragile infants. Incidence: 13 percent in critically ill; approximately 5 percent NICU graduates have permanent significant hearing loss.
    - Auditory structures are immature in premature infants, therefore, they are very vulnerable to damage from noise.
    - Noise may disrupt development of the auditory pathways and result in abnormal neural organization.

- A multidisciplinary group of clinicians and researchers made up the panel of experts at the *Physical and Developmental Environment of the High-Risk Infant Center, Study Group on NICU Sound*. It reviewed the research literature regarding the effect of sound on the fetus, newborn, and preterm infant and developed

recommendations based on the best evidence. The following excerpts (Graven, 2000) refer specifically to NICUs:

- "Infant intensive care units should incorporate a system of regular noise assessment.
- Sound limit recommendations are to maintain a nursery with an hourly Leq of 50 dB(A), an hourly L10 of 55 dB(A) and a 1-second Lmax of 70 dB(A), all A-weighted, slow response scale.
- Infant intensive care units should develop and maintain a program of noise control and abatement in order to operate within the recommended permissible noise criteria.
- Care practices must provide ample opportunity for the infant to hear parent voices live in interaction between parent and infant at the bedside.
- Earphones and other devices attached to the infant's ears for sound transmission should not be used at any time.
- There is little evidence to support the use of recorded music or speech in the environment of the high-risk infant. Audio recordings should not be used routinely or left unattended in the environment of the high-risk infant.
- CONCLUSION: The recommendations, if followed, should provide an environment that will protect sleep, support stable vital signs, improve speech intelligibility for the infant, and reduce potential adverse effects on auditory development" (Graven, 2000, S88-93).

- The American Academy of Pediatrics (1999) drew from strong data and expert opinion to state that the "noise level in a functioning NICU affects the infants, staff, and families."
  - "The level of noise is a result of the operational policies of the unit, the equipment selected for the unit, and the basic acoustic qualities of the unit's design and finishes."
  - There is background noise generated in the heating, ventilation, A/C systems, plumbing, communications, and computer systems.
  - "Transient sounds are generated by personnel and equipment." This can be controlled by personnel.
  - "Equipment should be selected with a noise criterion rating of ≤40."
  - The recommended Standard for Noise Control in the NICU (1999, S11):

    Infant bed areas and the spaces opening onto them shall be designed to produce minimal background noise and to contain and absorb much of the transient noise that arises within the nursery. The combination of continuous background sound and transient sound in any bed space or patient care area shall not exceed an hourly Leq of 50 dB and an hourly L10 of 55 dB (both A-weighted slow responses). The Lmax (transient sounds) shall not exceed 70dB (A-weighted slow response).

- Transient noise in the NICU may be caused by common caregiving activities such as hand washing, opening disposable equipment packages and storage drawers, doors opening, and trash disposal. This study presents a suggested intervention to decrease noise (Nagorski Johnson, 2003):
    - Assess the NICU environment with a dosimeter to determine normal sound levels
    - Develop a plan based on the assessment
    - Educate the staff to caregiving behaviors and sources of environmental noise. Promote awareness and cooperation through posters and guidelines.
    - Implement the plan (protocol) by making it visible (posted at bedside to inform family and visitors that premature infants need special environmental consideration)
    - Evaluate progress by reassessing with the dosimeter and posting results. Continue with this practice intermittently.

Resources for Environmental Support:

American Academy of Pediatrics (1999). Recommended standards for newborn ICU design. (Standard 23). *Journal of Perinatology 19*(8), Part 2, S11-S12. NY: Stockton Press.

Graven, S. (2000). Sound and the developing infant in the NICU: Conclusions and recommendations for care. *Journal of Perinatology 20*(8), Part 2, S88-S93. NY: Stockton Press.

Lefrak-Okikawa, L., & Houska Lund, C. (1993). Nursing practice in the neonatal intensive care unit. In M. Klaus & A. Fanaroff (Eds.), *Care of the high-risk neonate* (4th ed., p. 214). Philadelphia: W.B. Saunders Company.

Levy, G., Woolston, D., & Browne, J. (2003, March/April). Mean noise amounts in level II vs. level III neonatal intensive care units. *Neonatal Network 22*(2), 33-38.

Morris, B., Philbin, M. K., & Bose, C. (2000). Physiological effects of sound on the newborn. *Journal of Perinatology 20*(8), S55-S60. NY: Stockton Press.

Nagorski Johnson, A. (2003, October/December). Adapting the neonatal intensive care environment to decrease noise. *Journal of Perinatal and Neonatal Nursing 17*, 280-288.

Philbin, M. K., Robertson, A., & Hall III, J. (1999). Recommended permissible noise criteria for occupied, newly constructed or renovated hospital nurseries. *Journal of Perinatology 19*, Part 1, 559-563. NY: Stockton Press.

Robertson, A., Cooper-Peel, C., & Vos, P. (1999). Contribution of heating, ventilation, and air conditioning airflow and conversation to the ambient sound in a neonatal intensive care unit. *Journal of Perinatology 19*, 362-366. NY: Stockton Press.

Robertson, A., Cooper-Peel, C., & Vos, P. (1999). Sound transmission into incubators in the neonatal intensive care unit. *Journal of Perinatology 19*, 495-497. NY: Stockton Press.

Strauch, C., Brandt, S., & Edwards-Beckett, J. (1993, March). Implementation of a quiet hour: Effect on noise levels and infant sleep states. *Neonatal Network 12*(2), 31-35.

Prepared by B. Zapalo, 8/05

Worksheet for Noise Level in the NICU

1. Journaling.

    a. Transient noise in the NICU may be caused by common caregiving activities such as hand washing, opening disposable equipment packages and storage drawers, doors opening and closing, and trash disposal. List some of the primary contributors to noise that our unit has.

    b. According to the research and using the assessments below, how would you assess present practice in our NICU? Use the Dosimeter.

    Assessment for Noise Level in the NICU
    _____ Highest reading of noise level is at or above 75 dB.
    _____ Highest reading of noise level is between 66-74 dB.
    _____ Highest reading of noise level is between 60-65 dB.
    _____ Noise level is at or below 59 dB.

    Assessment for the Use of Communicative Voices at the NICU Bedside
    _____ Loud conversation.
    _____ Ongoing conversation/background distant conversation.
    _____ Conversation 50% of the time in the room.
    _____ Conversation less than 50% of the time in room/no conversation.

    c. Considering the research and the recommendations, what could we do to improve the situation? Write at least 2-3 suggestions.

2. Discussion.
3. Dialogue/Problem Solve.
4. Plan.
    a. Write/plan at least 3 interventions to actively promote a reduction in the noise level.
    b. Write an assessment to derive a baseline of practice and to compare practice after interventions.

    (5 will be completed before next meeting; 6 and 7 will be addressed at next meeting.
5. Implement Plan. Use Assessment Tool.
6. Critique Plan and Make Necessary Changes.
7. Implement New Plan.

Prepared by B. Zapalo, 8/05

DEVELOPMENTALLY SUPPORTIVE/FAMILY-CENTERED CARE IN THE NICU
Individualized Support

Positioning Infants in the NICU – Tenets and Research Findings

- State-of-the-art practice (best practice) considers the long-term development of the infant. This is based upon facts, i.e. evidence-based practice. What happens if we neglect correct positioning of critically ill infants? Hunter (1999) enumerated medical and developmental consequences such as:
    - Hypotonia or weakness
    - "W" positioning in the upper extremities due to shoulder external rotation and retraction with scapular adduction
    - "M" positioning in the lower extremities
    - "Frog-leg" postures
    - Toe-walking
    - Decreased depth of rib cage, with possible respiratory problems
    - Lateral skull flattening—dolicephaly
    - Asymmetrical positioning—most infants tend to turn their heads to the right. If left in that position, approximately 70% will keep it there.
    - There is a relationship between grooved palate and prolonged oral intubation.

- Therapeutic positioning goals consider medical and developmental factors of the individual infant to:
    - Increase infant physiologic stability
    - Increase infant comfort
    - Decrease positional deformities (Hunter, 1999; Lefrak & Houska Lund, 2001)

- Prone positioning is preferred "when physiological stability is the most important goal" (Young, 1996, p. 67). This position facilitates lung function and improves oxygenation. Also, it encourages flexion of extremities.
    - To prevent external rotation of the hip, use a hip roll or a soft gel product. "Position baby with some pelvic elevation so that lower limbs are bearing weight through the anterior knee." Hip should not be flexed more than 90 degrees. Use a roll (or Baby Bendy) to "nest" the baby and to provide tactile stimulation or containment, as the barrier walls of the uterus. Place the infant's hand near his/her face for self-comforting.
    - Side-lying is preferred to the supine position. Support the trunk by providing a wedge or rolled blanket behind the back. Place a folded sheet (bandana, or SnuggleUp) across the pelvis to maintain stability and flexion. Place a soft roll between legs to "maintain neutral lower extremity positioning," and a soft cloth "under the supporting hip to rotate the pelvis and assist in flexion of the upper leg so that it may rotate and rest on the

mattress" (Young, 1996, p. 70). Rolls or Baby Bendy behind the baby can help him/her maintain this position (Johnson, 2005). In this position, the infant's hand can be reached by him/her for sucking and self-comforting.

- Supine positioning is the least preferred. Gravity pulls extremities down toward the bed, causing adduction of the shoulders and hips. The infant must be supported in a state of flexion. The head, body and feet need to be supported midline. In order to reduce hip and should adduction, knees and arms need to be lifted and supported by rolls (Young, 1996).

- Using a "nose to knees to nipples" alignment helps to position the infant correctly (Johnson, 2005).

- Gel pillows are used to help to prevent head flattening (dolichocephaly).

- The use of positioning aids helps the infant maintain his/her valuable calories because he/she is not thrashing around the crib. The aids also "help to improve muscle tone as the baby has surfaces to flex against" (Young, 1996, p.22).

- "The key to optimal positioning and support is the individualized and thoughtful assessment of each infant on an ongoing basis with sensitivity to subtle signs of disorganization, which are then attended to in a timely fashion. In light of their decreased muscle tone, premature infants may be inadequately supported on their back or their stomach. Therefore supporting the infant in a softly flexed position in sidelying may often be most beneficial" (Lawhon, 1997, p. 57).

Resources for Positioning:

Becker, P., Grunwald, P., Moorman, J., & Stuhr, S. (1993). Effects of developmental care on behavioral organization in very-low-birth-weight infants. *Nursing Research 42*, 214-220.

Children's Medical Ventures, Inc. (2005). Positioning posters. Norwell, MA

Fern, D. (1998). *Developmentally appropriate positioning.* A poster demonstrating positioning products based on overall goals of positioning. South Weymouth, MA: Children's Medical Ventures, Inc.

Hunter, J. (1999). Therapeutic positioning in the NICU. In *Developmental care in depth: From womb to home.* Pre-conference workshop at the 1999 international conference, *The Physical and Developmental Environment of the High-Risk Infant,* January 27-30, 1999. Clearwater Beach, FL.

Johnson, K. (2005). Presentation to Magee-Womens Hospital NICU staff by Educational Coordinator, Children's Medical Ventures, Inc.

Koch, S. (1999). Developmental support in the neonatal intensive care unit. In J. Deacon & P. O'Neill (Eds.), *Core curriculum for neonatal intensive care nursing* (2nd ed., pp. 527-529). Philadelphia: W.B. Saunders Company.

Lawhon, g. (1997). Providing developmentally supportive care in the newborn intensive care unit: An evolving challenge. *Journal of Perinatal and Neonatal Nursing. 10*(4), p. 48-61.

Lefrak-Okikawa, L., & Houska Lund, C. (2001). Nursing practice in the neonatal intensive care unit. In M. Klaus & A. Fanaroff (Eds.), *Care of the high-risk neonate* (5th ed., pp. 223-242). Philadelphia: W.B. Saunders Company.

Vergara, E., & Bigsby, R. (2004). Elements of neonatal positioning. In *Developmental & therapeutic interventions in the NICU* (pp. 177-203). Baltimore: Brookes.

Young, J. (1996). Neuromotor development. In *Developmental care of the premature baby* (pp. 60-85, 111-113). London: Baillière Tindall.

Resources for Hand positioning and Use of Pacifier:

Franck, L., & Lawhon, G. (1998). Environmental and behavioral strategies to prevent and manage neonatal pain. *Seminars in Perinatology 22*, 434-443.

Gill, N., Behnke, M., Conlon, M., McNeeley, J., & Anderson, G. (1988). Effect of nonnutritive sucking on behavioral state in preterm infants before feeding. *Nursing Research 37*, 347-350.

Jorgensen, K. (1999). Pain assessment and management in the newborn infant. *Journal of PeriAnesthesia Nursing 14*, 349-356.

McCain, G. (1992). Facilitating interactive awake states in preterm infants: A study of three interventions. *Nursing Research 41*, 157-160.

Porter, E., & Anderson, G. (1979). Non-nutritive sucking during tube feedings: Effect on clinical course in premature infants. *Journal of Obstetrics, Gynecologic and Neonatal Nursing 8*, 265-272.

Prepared by B. Zapalo, 8/05

Worksheet for Positioning in the NICU

Journaling.

Using the assessment tools below for each of the positioning criteria (Positioning Tools, Baby Bendy, SnuggleUp and Hand Positioning), how would you assess present practice in our NICU?

Assessment for Positioning

_____ Positioning tools are not present.
_____ Positioning tools are not being utilized correctly/Tools need adjusted.
_____ Infant is positioned in the positioning tools or infant is being held, but infant needs adjustment.
_____ Infant is properly positioned or held properly (flexed and aligned).

Assessment for Use of Baby Bendy

_____ Baby Bendy is not used/is used improperly—not close to infant.
_____ Wrong size Baby Bendy is used.
_____ Infant is positioned in the appropriate size Baby Bendy, but he/she needs adjustment.
_____ Infant is properly positioned (flexed and aligned) in the appropriate size Baby Bendy.

Assessment for Use of SnuggleUp

_____ SnuggleUp is not used.
_____ Wrong size SnuggleUp is used or infant is positioned incorrectly.
_____ Infant is positioned in the SnuggleUp, but needs adjustment.
_____ Infant is properly positioned (flexed and aligned) in the appropriate size SnuggleUp.

Assessment for Hand Positioning

_____ Hands are tucked due to medical consideration.
_____ Hands are tucked or swaddled away from infant's midline.
_____ Hands are swaddled midline, but out of infant's reach.
_____ Hands are available to infant, but not supported midline.
_____ Hands are midline and available for sucking or infant is prone with hands by face.

Discussion.

If you could change the assessments above, what would you add or take away? Step out to one or two rooms and try the assessments on the rooms.

Dialogue/Problem Solve.

Are these good tools upon which we could assess our NICU and base training of our staff? Why/why not?

Prepared by B. Zapalo, 8/05

DEVELOPMENTALLY SUPPORTIVE/FAMILY-CENTERED CARE IN THE NICU

Family-Centered Care in the NICU – Tenets and Research Findings

- The goal of Family-centered Care is to promote partnership with families to improve the medical, emotional, and developmental outcomes for our infants (Heermann & Wilson, 2000).

- We have protocol- and procedure-driven care and we must move toward care that is family-centered and developmentally appropriate. We must encourage relationship-based professional identities rather than technological identities (Heermann & Wilson, 2000). This does not throw out the protocols and procedures. It gives dignity to the family by including family members in the purpose of the procedures and in the support of the infant during the procedures. It is "people-oriented." Also, it increases dignity to our profession as caregivers.

- Although it is paramount to "put the infant first," the reality is that the infant is part of the family, therefore, "putting the infant first" means to include his/her care within the context of his/her family. (Heermann & Wilson, 2000). If we position the infant, we must teach the family ***why*** we are positioning the infant and ***how*** the family should do the same. Just as we discussed what would happen if we neglect correct positioning of the infant, so too, we must consider: What would happen if we neglect teaching correct positioning to the family? Likewise, when we read and react to infant's cues, dim the lights or use soft voices, we must explain ***why*** and teach the family ***how*** to do the same. Teaching and modeling these tenets to each family as it becomes a member of the NICU will increase respect within the NICU. Problems of loudness and inconsiderateness of our patients will be noticeably less when each family "owns" the knowledge and becomes an active participant of developmentally supportive care.

- Fostering the parent as caregiver requires reorganization of **the nurse from being the best at her/his skill to helping the parent become the best at the skill.** We become ***a resource*** rather than the primary caregiver. Caregiving becomes shared. Parents move from being scared to becoming confident in their infants' care.

- Just as we have become skilled at reading the infant's cues, so too we must become skilled at reading the parents' cues and give them support with the information they need to progress from active caregivers to decision-makers to best meet their child's needs.

- We have the facility to implement the Family-Centered Care model. We must become "reflective practitioners," that is, we must be open-minded and follow the guidance of the research and make it our own evidence-based practice. With our

wealth of experiences, we will learn to problem-solve the areas that need addressed. We will work with opposition, using education and experiential knowledge. We will model developmentally supportive techniques to our fellow-providers and to parents. Given the research that is available, there is no excuse for a NICU to refuse to develop this model as a standard of care (Merenstein, 1994).

Resources for DSC:

Heermann, J. A., & Wilson, M. E. (2000, June). Nurses'experiences working with families in an NICU during implementation of family-focused developmental care. *Neonatal Network 19*(4), 23-29.

Merenstein, G. B. (1994). Individualized developmental care: An emerging new standard for neonatal intensive care units? Editorial. *Journal of the American Medical Association 272*, 890-891.

Additional Resources for DSC:

Becker, P., Grunwald, P., Moorman, J., & Stuhr, S. (1993). Effects of developmental care on behavioral organization in very-low-birth-weight infants. *Nursing Research 42*, 214-220.

Fern, D. (1998). Developmentally appropriate positioning. A poster demonstrating positioning products based on overall goals of positioning. South Weymouth, MA: Children's Medical Ventures, Inc.

Koch, S. (1999). Developmental support in the neonatal intensive care unit. In J. Deacon & P. O'Neill (Eds.), *Core curriculum for neonatal intensive care nursing* (2nd ed., pp. 527-529). Philadelphia: W.B. Saunders Company.

Lawhon, g. (1997). Providing developmentally supportive care in the newborn intensive care unit: An evolving challenge. *Journal of Perinatal and Neonatal Nursing 10*(4), 48-61.

Lefrak-Okikawa, L., & Houska Lund, C. (1993). Nursing practice in the neonatal intensive care unit. In M. Klaus & A. Fanaroff (Eds.), *Care of the high-risk neonate* (4th ed., pp. 215-216). Philadelphia: W.B. Saunders Company.

Prepared by B. Zapalo, 8/05

Worksheet for Family-Centered/Developmentally Supportive Care in the NICU

Journaling.

How are your experiences using Family-Centered Care and Developmentally Supportive Care different than your experiences using the traditional model of care?

What can you do to improve your model of Family-Centered/Developmentally Supportive Care? What can you do to help other caregivers improve their model of care?

Discussion.

Discuss the Journaling Questions with your partner. What are the problems that have to be considered?

Dialogue/Problem Solve.

How can we address these problems? (*Think Outside the Bowl*!)

Prepared by B. Zapalo, 8/05

DEVELOPMENTALLY SUPPORTIVE/FAMILY-CENTERED CARE IN THE NICU

Kangaroo Care in the NICU – Tenets and Research Findings

- Klaus and Kennel's classic research (1976) stressed the importance of mother/infant physical contact immediately after birth to promote bonding and its impact on relationship. This has implications to the success and length of time of breastfeeding. "The release of oxytocin and the sensory response to touch after birth when the areola and nipple are extremely sensitive have been cited as reasons for the positive effects" (INFACT Newsletter, 1995).

- The following benefits of Kangaroo Care have been reported after 2 decades of implementation in studies in both developing and industrialized nations: "better survival rates, improved ability to breastfeed, improved temperature control, heart rate, breathing, growth and reduced respiratory infections" (INFACT Newsletter, 1995).

- Advantages listed by Hedberg Nyqvist (2004) listed the same as above with the additional: "…there is no risk for hypothermia; infants sleep just as well in the kangaroo position as in incubators; infants show better tolerance of enteral and oral feedings; parents are supported in their natural roles as parents and primary caregivers; and mothers are supported in the initiation and maintenance of lactation" (p. 72).

- Hedberg Nyqvist (2004) also listed these benefits, but related that these may not apply to every dyad: improved growth; shorter hospital stays for infants; improved maternal milk production; increased duration of breastfeeding; reductions in maternal stress, and increases in maternal feelings of empowerment.

- Generally, U.S. mothers practice Kangaroo Care for only one or a few hours per day. (Hedberg Nyqvist, 2004).

- Barriers to establishing Kangaroo Care may include safety aspects, a lack of implementation guidelines, inconsistent attitudes among staff members, and parental self-limited visitation.

- Implementation may follow these guidelines:

    - Providing information about Kangaroo Care to parents
    - Acquiring permission from neonatologists prior to initiating Kangaroo Care in cases with certain criteria such as: implementation during 1st week of life; g.a. < 27weeks due to immature skin; b.w. < 1000 g; ventilator treatment; presence of arterial/venous catheter; serum osmolality or sodium outside normal limits; severe instability with episodes of apnea

and bradycardia associated with common caregiving procedures; recent surgery with large wounds or drainage. (Hedberg Nyqvist, 2004)
- Planning and preparing with staff and parents
- Transferring from incubators to KC position
- Assuring skin-to-skin contact
- Encouraging breastfeeding
- Postponing or interrupting KC (for signs of instability, for procedures, or to attend to emergencies in the nursery that will leave dyad unsupervised)
- Early discharge

Resources for Kangaroo Care:

Hedberg Nyqvist, K. (2004). How can Kangaroo Mother Care and high technology care be compatible? *Journal of Human Lactation 20*(1), 72-74.

INFACT Newsletter (Winter 1995) Online: www.infactcanada.ca/newsletter_Winter_1995.htm

Kangaroo care congress report. (1999). In The NANN pages. *Neonatal Network 18*(4), 55-56.

Klaus, M., & Kennel, J. (1976). *Maternal-Infant Bonding.* St. Louis: Mosby Press.

Additional Resources for Kangaroo Care:

Legault, M., & Goulet, C. (1995). Comparison of kangaroo and traditional methods of removing preterm infants from incubators. *Journal of Obstetric, Gynecologic and Neonatal Nursing 24*, 501-506.

Messmer, P., Rodriguez, S., Adams, J., Wells-Gentry, J., Washburn, K., Zabaleta, I., & Abreu, S. (1998, May/June). Effect of kangaroo care on sleep time for neonates. *Neonatal Intensive Care*, 31-43.

Neu, M. (1999). Parents' perception of skin-to-skin care with their preterm infants requiring assisted ventilation. *Journal of Obstetric, Gynecologic and Neonatal Nursing 28*, 157-164.

Prepared by B. Zapalo, 8/05

Worksheet for Kangaroo Care in the NICU

Journaling.

List successes you have had in Kangaroo Care.
What are the difficulties?
When was the last time you tried Kangaroo Care with a patient and family?

Discussion.

Before we moved into the new NICU, we acknowledged that privacy for the family was the main problem with Kangaroo Care. Now that privacy is no longer an issue, what are the major problems with Kangaroo Care?

Dialogue/Problem Solve.

If we realize that Kangaroo Care is best practice and that it will benefit our patients, how can we address the problems that we listed? (Think Outside the Bowl!)

Plan.

What is a viable plan to work Kangaroo Care back into our caregiving model?

Implement Plan:

For this week, introduce Kangaroo Care to one family by assisting one nurse as she demonstrates the practice.

Assessment for Kangaroo Care in the NICU

_____ Infant is not stable enough for Kangaroo Care (medical consideration).
_____ Family is not participating in Kangaroo Care.
_____ Family is participating in Kangaroo Care.

Prepared by B. Zapalo, 8/05

Magee-Womens Hospital
Neonatal Intensive Care Unit
Learning Organization

AGENDA: Family-Centered Care

Sign in sheet

Demographic Information – need 1

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Poster: *Think…*

Gold-Standard Unit

Establish Meeting Times

Revisit Easy/Difficult Families in the NICU – Share: Demonstrated technique

Developmentally Supportive Care
- Environmental Support
- Individualized Support
- Positioning
- Family-Centered Care
- Co-bedding Multiples

Journaling Activity
- Evaluating our use of Co-bedding Multiples
- Pair – Share
- Discussion
- Dialogue/Problem Solve: Think Outside the Bowl
- Plan

Closure – Next Meeting

Prepared by B. Zapalo, 8/05

DEVELOPMENTALLY SUPPORTIVE/FAMILY-CENTERED CARE IN THE NICU

Co-bedding Multiples in the NICU – Tenets and Research Findings

- "Twins may have a special capacity for supporting each other (co-regulation) because of their common intrauterine experiences. Co-regulatory activities observed in preterm twins during co-bedding include moving closer, touching, holding, hugging, rooting, sucking on each other, smiling, being awake at the same time, and decreased need for ambient temperature support. This simple clinical strategy of co-bedding twins may be a significant innovation for supporting preterm and full-term twins during their transition to extrauterine life" (Hedberg Nyqvist & Lutes, 1998, p. 450).

- "If twins are aware of the intrauterine sharing, are they also aware of the intrauterine loss? Because of twins' intrauterine experiences, it may be reasonable to assume that they are born with unique expectations about what constitutes a natural habitat after birth, and their transition may be facilitated by stimuli generated from uninterrupted physical contact" (Hedberg Nyqvist & Lutes, 1998, p. 451).

- "Twin co-bedding is an innovation based on knowledge of twins' synchrony in sleep and awake states caused by their intrauterine tactile communication and physiologic interdependence" (Hedberg Nyqvist & Lutes based on Lutes, 1996). Co-bedding acknowledges that a reciprocal relationship and interaction has taken place since conception (Lutes, 1996).

- "Co-bedding is believed to promote physiological stability, co-regulation, growth, and development" (Byers, Yovaish, Lowman, & Francis, 2003, p. 341).

- Co-bedding provides families with the opportunity to care for infants in a manner similar to what they will experience at home.

- Co-bedding has been the standard of care in Europe since the 1980s. It began in the U.S. in 1994 (Lutes, 1996).

- The first reported case in the U.S. occurred in Worcester, MA. A small unstable 28-weeks g.a. infant was co-bedded with her larger sister. The little one quickly co-regulated to her sister's activity, allowing energy for growth and stabilization. Their mother "believed that co-bedding was critical to her infants' outcomes" (Byers, Yovaish, Lowman, & Francis, 2003, p. 341).

- In a Swedish study, mothers of twins observed and "reported that their infants were more restless during separation and interpreted their increased motor

behavior as signs that they missed and looked for the other twin" (Hedberg Nyqvist & Lutes, 1998, p. 452).

- In the same study, five mothers believed that their infants preferred a face-to-face position, reporting that the infants were "calmer and more secure" when in this position.

- Barriers to Co-bedding should include limitations and restrictions as listed on our protocol. Parents should be informed and encouraged to co-bed infants.

- Review Magee-Womens Hospital NICU Protocol for Co-Bedding of Multiples.

Resources for Co-bedding:

Byers, J. F., Yovaish, W., Lowman, L. B. & Francis, J. D. (May/June 2003), *Journal of Obstetric, Gynecologic and Neonatal Nursing 32*, 340-347.

Hedberg Nyquist, K. & Lutes, L. (1998). Co-bedding twins: A developmentally supportive care strategy. *Journal of Obstetric, Gynecologic and Neonatal Nursing 27*, 450-456.

Lutes, L. (1996). Bedding twins/multiples together. *Neonatal Network 15*(7), 61-62.

Prepared by B. Zapalo, 8/05

Worksheet for Co-bedding Multiples in the NICU

1. Journaling.
    a. What are the successes you've observed in co-bedding?
    b. What are the difficulties?
    c. How do you encourage co-bedding with a family? With the nursing staff?

2. Discussion.
    Do we acknowledge that co-bedding is best practice for stable multiples?

3. Dialogue/Problem Solve.
    If we do not acknowledge that co-bedding is best practice for stable multiples, (or even if we do acknowledge it) how can we gain confidence in assuring that it ***is*** best practice? (Think Outside the Bowl!)

4. Plan.
    What is a viable plan to work Co-bedding into our caregiving model with approximately a 95% rate?

5. Implement Plan.

Assessment for Co-bedding Multiples in the NICU

_____ Infants are not stable enough co-bed (medical consideration).
_____ Infants are not co-bedded.
_____ Infants are co-bedded.

Prepared by B. Zapalo, 8/05